



# CONFIGURATION GUIDE

# PMP/ PTP450 Series

# System Release 24.0

Covers: PMP450 AP/ PMP450 SM/ PTP450 / PMP450d PMP450i/ PTP450i PMP450b/ PMP450b6/PTP450b PMP450 MicroPoP PMP/PTP450 b Retro PMP450v





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# About This User Guide

This guide describes configuration and operation of the Cambium Point-To-Point (PTP) and Point-To-Multipoint (PMP) wireless Ethernet bridges. It covers PMP/PTP 450, 450i, 450b, 450d, PMP 450m, and 450v platform Series. It is intended for use by the system designer, system installer and system administrator.

For system configuration, tools and troubleshooting, refer to the following chapters:

- Chapter 1: Configuration
- Chapter 2: Tools
- Chapter 3: Operation
- Chapter 4: Reference information
- Chapter 5: Troubleshooting

# **Contacting Cambium Networks**

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### **Purpose**

Cambium Networks PMP/PTP 450 documents are intended to instruct and assist personnel in the operation, installation and maintenance of the Cambium PMP/PTP equipment and ancillary devices of 450 Platform Family. It is recommended that all personnel engaged in such activities be properly trained.

Cambium disclaims all liability whatsoever, implied or express, for any risk of damage, loss or reduction in system performance arising directly or indirectly out of the failure of the customer, or anyone acting on the customer's behalf, to abide by the instructions, system parameters, or recommendations made in this document.

### Product notation conventions in document

This document covers Cambium 450 Series, 450b series, 450i Series and 450m Series products. The following notation conventions are followed while referring to product series and product family:

Product notation	Description		
450 Platform Family	Refers to the complete 450 Series family, which includes 450 Series, 450i Series, 450b Series, 450m Series, 450 MicroPoP Series and 450b Retro Series		
450 Series	Refers to 450 Series devices in the following configurations:		
	• PMP 450		
	<ul> <li>AP [2.4, 3.5, 3.65, 5 GHz]</li> </ul>		
	<ul> <li>Connectorized/Integrated</li> </ul>		
	<ul> <li>SM [900 MHz and 2.4, 3.5, 3.65, 5 GHz]</li> </ul>		
	<ul> <li>Connectorized/Integrated</li> </ul>		
	• PTP 450 BHM/ BHS [900 MHz and 3.5, 3.65, 5 GHz]		
	<ul> <li>Connectorized/Integrated</li> </ul>		
	• PMP 450d SM [5 GHz]		
450i Series	Refers to 450i Series devices in the following configurations:		
	• PMP 450i		
	<ul> <li>AP [900 MHz and 3, 5 GHz]</li> </ul>		
	<ul> <li>Connectorized/Integrated</li> </ul>		
	<ul> <li>SM [3 GHz and 5 GHz]</li> </ul>		
	<ul> <li>Connectorized/Integrated</li> </ul>		
	• PTP 450i BHM/ BHS [3 GHz and 5 GHz]		
	<ul> <li>Connectorized/Integrated</li> </ul>		
450b Series	Refers to 450b Series devices in the following configurations:		
	PMP 450b Mid-Gain		
	• SM [5 GHz]		
	<ul> <li>Integrated</li> </ul>		
	• PMP 450b High Gain		
	<ul> <li>SM [3 GHz and 5 GHz] - Dish</li> </ul>		
	• PTP 450b Mid-Gain		
	○ BHM/BHS [5 GHz]		
	<ul> <li>Integrated</li> </ul>		

Product notation	Description			
	PTP 450b High Gain			
	<ul> <li>BHM/BHS [3 GHz and 5 GHz] - Dish</li> </ul>			
450m Series	Refers to 450m Series device configuration:			
	• PMP 450m AP (5 GHz)			
	• Integrated			
	• PMP 450m AP (3 GHz)			
	• Integrated			
450 MicroPoP AP	Refers to 450 MicroPoP Series device configuration:			
Series	PMP 450 MicroPoP Omni 5 GHz Integrated			
	PMP 450 MicroPoP Sector 5 GHz Integrated			
	PMP 450 MicroPoP 5 GHz Connectorized			
450b Retro Series	Refers to 450b Retro Series device configuration:			
	PMP 450b Retro SM 5 GHz Integrated			
450v	Refers to 450v Series devices in the following configurations:			
	• AP 5/6 GHz (4x4)			
	• Integrated			
	• SM 5/6 GHz (4x4)			
	<ul> <li>Integrated</li> </ul>			
	• SM 5/6 GHz (2x2)			
	<ul> <li>Integrated</li> </ul>			

### **Cross references**

References to external publications are shown in italics. Other cross references, emphasized in blue text in electronic versions, are active links to the references.

This document is divided into numbered chapters that are divided into sections. Sections are not numbered but are individually named at the top of each page, and are listed in the table of contents.

# Feedback

We appreciate feedback from the users of our documents. This includes feedback on the structure, content, accuracy, or completeness of our documents. To provide feedback, visit our support website. <a href="https://support.cambiumnetworks.com">https://support.cambiumnetworks.com</a>.



#### Caution

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation

# Important regulatory information

The 450 Platform Family products are certified as an unlicensed device in frequency bands where it is not allowed to cause interference to licensed services (called primary users of the bands).

### **Application software**

Download the latest 450 Platform Family software and install it in the Outdoor Units (ODUs) before deploying the equipment. Instructions for installing software are provided in Upgrading the software version and using CNUT on page 1.

### **USA specific information**

The USA Federal Communications Commission (FCC) requires manufacturers to implement special features to prevent interference to weather radar systems that operate in the band 5600 MHz to 5650 MHz. These features must be implemented in all products able to operate outdoors in the band 5470 MHz to 5725 MHz.

Manufacturers must ensure that such radio products cannot be configured to operate outside of FCC rules; specifically, it must not be possible to disable or modify the radar protection functions that have been demonstrated to the FCC.

Cambium supplies variants of the 5 GHz 450, 450i, 450b, and 450m Series specifically for operation in the USA to comply with FCC requirements (KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02). These variants are only allowed to operate with license keys that comply with FCC rules.

To ensure compliance when using PMP 450 Series and PTP 450 Series, follow the recommendation in Avoidance of weather radars (USA only).

#### **External antennas**

When using a connectorized version of the product, the conducted transmit power may need to be reduced to ensure the regulatory limit on transmitter EIRP is not exceeded. The installer must have an understanding of how to compute the effective antenna gain from the actual antenna gain and the feeder cable losses.

The range of permissible values for maximum antenna gain and feeder cable losses are included in this user guide together with a sample calculation. The product GUI automatically applies the correct conducted power limit to ensure that it is not possible for the installation to exceed the EIRP limit, when the appropriate values for antenna gain and feeder cable losses are entered into the GUI.

#### Avoidance of weather radars (USA only)

To comply with FCC rules (KDB 443999: Interim Plans to Approve UNII Devices Operating in the 5470 - 5725 MHz Band with Radar Detection and DFS Capabilities), units which are installed within 35 km (22 miles) of a Terminal Doppler Weather Radar (TDWR) system (or have a line of sight propagation path to such a system) must be configured to avoid any frequency within +30 MHz or -30 MHz of the frequency of the TDWR device. This requirement applies even if the master is outside the 35 km (22 miles) radius but communicates with outdoor clients which may be within the 35 km (22 miles) radius of the TDWRs. If interference is not eliminated, a distance limitation based on line-of-sight from TDWR will need to be used. Devices with bandwidths greater than 20 MHz may require greater frequency separation.

When planning a link in the USA, visit <u>http://spectrumbridge.com/udia/home.aspx</u>, enter the location of the planned link and search for TDWR radars. If a TDWR system is located within 35 km (22 miles) or has line of sight propagation to the PTP device, perform the following tasks:

- Register the installation on <a href="http://spectrumbridge.com/udia/home.aspx">http://spectrumbridge.com/udia/home.aspx</a>.
- Make a list of channel center frequencies that must be barred, that is, those falling within +30 MHz or -30 MHz of the frequency of the TDWR radars.

The 450 Platform Family AP must be configured to not operate on the affected channels.

## Canada specific information



### Caution

This device complies with ISEDC 's license-exempt RSSs. Operation is subject to the following two conditions:

(1) This device may not cause interference; and

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

ISEDC requires manufacturers to implement special features to prevent interference to weather radar systems that operate in the band 5600 MHz to 5650 MHz. These features must be implemented in all products able to operate outdoors in the band 5470 MHz to 5725 MHz.

Manufacturers must ensure that such radio products cannot be configured to operate outside of ISEDC rules; specifically it must not be possible to disable or modify the radar protection functions that have been demonstrated to ISEDC.

In order to comply with these ISEDC requirements, Cambium supplies variants of the 450 Platform Family for operation in Canada. These variants are only allowed to operate with license keys that comply with ISEDC rules. In particular, operation of radio channels overlapping the band 5600 MHz to 5650 MHz is not allowed and these channels are permanently barred.

In addition, other channels may also need to be barred when operating close to weather radar installations.

Other variants of the 450 Platform Family are available for use in the rest of the world, but these variants are not supplied to Canada except under strict controls, when they are needed for export and deployment outside Canada.

Devices shall not be used for control of or communications with unmanned aircraft systems.

Les appareils ne doivent pas être utilisés pour contrôler ou communiquer avec des systèmes d'aéronefs sans pilote.

Operation on oil platforms, automobiles, trains, maritime vessels and aircraft shall be prohibited.

L'exploitation sur les plates-formes pétrolières, les automobiles, les trains, les navires maritimes et les aéronefs est interdite.

The antenna height shall be determined by the installer or operator of the standard-power access point or fixed client device, or by automatic means. This information shall be stored internally in the device. Provision of accurate device information is mandatory.

La hauteur de l'antenne doit être déterminée par l'installateur ou l'opérateur du point d'accès à puissance standard ou de l'appareil client fixe, ou par des moyens automatiques. Ces informations doivent être stockées en interne dans l'appareil. La fourniture d'informations précises sur l'appareil est obligatoire.

# Renseignements specifiques au Canada



#### Attention

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

ISEDC a demandé aux fabricants de mettre en œuvre des mécanismes spécifiques pour éviter d'interférer avec des systèmes radar fonctionnant dans la bande 5600 MHz à 5650 MHz. Ces mécanismes doivent être mis en œuvre dans tous les produits capables de fonctionner à l'extérieur dans la bande 5470 MHz à 5725 MHz.

Les fabricants doivent s'assurer que les produits de radiocommunications ne peuvent pas être configurés pour fonctionner en dehors des règles ISEDC, en particulier, il ne doit pas être possible de désactiver ou modifier les fonctions de protection des radars qui ont été démontrés à ISEDC.

Afin de se conformer à ces exigences de ISEDC, Cambium fournit des variantes du 450 Platform Family exclusivement pour le Canada. Ces variantes ne permettent pas à l'équipement de fonctionner en dehors des règles de ISEDC. En particulier, le fonctionnement des canaux de radio qui chevauchent la bande 5600-5650 MHz est interdite et ces canaux sont définitivement exclus.

#### **ISEDC** approved antennas

The list of antennas used to obtain ISEDC approvals is provided in section Country specific radio regulations, Innovation Science and Economic Development Canada (ISEDC) specific information, Table 233 Canada approved dedicated external antenna list 4.9 and 5.8 GHz.

#### Figure 1: 450v AP





#### Note

When the 450v AP unit aligns with a 2-degree downtilt, the antenna pattern complies with the +21 dBm EIRP requirement from +30 degrees above the horizon to -180 degrees for FCC and Canada in the 5150MHz to 5250MHz band (U-NII-1).

#### Figure 2: 450v SM





#### Note

Align the 450v SM to zero degrees elevation to guarantee compliance, ensuring that all emissions above 30 degrees are below +21 dBm EIRP.



#### Warning

The operation of the 450v device is prohibited on oil platforms, cars, trains, boats, and aircraft.

Operation of transmitters in the 5.925-7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.

#### **Exposure distances for PMP 450v devices**

Below provides information about exposure distances for PMP 450v devices based on device type and antenna configuration:

Device type	Antenna Type	Exposure Distance (cm)
450v AP	-	36
450v SM	Dish antenna	108
	Patch antenna	20

#### Antennas externes

Lorsque vous utilisez une version du produit sans antenne intégrée, il peut être nécessaire de réduire la puissance d'émission pour garantir que la limite réglementaire de puissance isotrope rayonnée équivalente (PIRE) n'est pas dépassée. L'installateur doit avoir une bonne compréhension de la façon de calculer le gain de l'antenne réelle et les pertes dans les câbles de connections.

La plage de valeurs admissibles pour un gain maximal de l'antenne et des pertes de câbles de connections sont inclus dans ce guide d'utilisation avec un exemple de calcul. L'interface utilisateur du produit applique automatiquement la limite de puissance menée correct afin de s'assurer qu'il ne soit pas possible pour l'installation de dépasser la limite PIRE, lorsque les valeurs appropriées pour le gain d'antenne et les pertes de câbles d'alimentation sont entrées dans l'interface utilisateur.

#### Antennes approuvées par ISEDC

La liste des antennas approveés pour l'operation au Canada est founie dans le chapitre Country specific radio regulations, Innovation Science and Economic Development Canada (ISEDC) specific information tableaux Table 233 Canada approved dedicated external antenna list 4.9 and 5.8 GHz.

## **EU Declaration of Conformity**

Hereby, Cambium Networks declares that the Cambium 450 Series, 450b Series, 450i Series and 450m Series Wireless Ethernet Bridge complies with the essential requirements and other relevant provisions of Radio Equipment Directive 2014/53/EU. The declaration of conformity may be consulted at:

https://www.cambiumnetworks.com/eu\_dofc

### Specific expertise and training for professional installers

To ensure that the 450 Platform Family products – PMP/PTP 450 Series, PMP/PTP 450i Series, PMP 450m Series are installed and configured in compliance with the requirements of ISEDC and the FCC, installers must have the radio engineering skills and training described in this section.

The Cambium Networks technical training program details can be accessed from below link:

https://www.cambiumnetworks.com/training/

### **Ethernet networking skills**

The installer must have the ability to configure IP addressing on a PC and to set up and control products using a web browser interface.

### **Lightning protection**

To protect outdoor radio installations from the impact of lightning strikes, the installer must be familiar with the normal procedures for site selection, bonding and grounding. Installation guidelines for the 450 Platform Family can be found in Chapter 2: System hardware and Chapter 3: System planning of 450 Platform Planning and Installation Guide.

### Training

The installer needs to have basic competence in radio and IP network installation. The specific requirements applicable to the 450 Platform should be gained by reading:

Chapter 4: Preparing for installation and Chapter 5: Installation of 450 Platform Planning and
Installation Guide

- Chapter 1: Configuration, Chapter 2: :Tools, and Chapter 3: Operation of 450 Platform Configuration Guide (this document),
- And by performing sample set ups at base workshop before live deployments.

The Cambium Networks technical training program details can be accessed from below link:

https://www.cambiumnetworks.com/training/

FCC

The operation of this device is prohibited on oil platforms, cars, trains, boats, and aircraft.

Operation of transmitters in the 5.925 - 7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.

IC

Devices shall not be used for control of or communications with unmanned aircraft systems.

Les appareils ne doivent pas être utilisés pour contrôler ou communiquer avec des systèmes d'aéronefs sans pilote.

Operation on oil platforms, automobiles, trains, maritime vessels and aircraft shall be prohibited.

L'exploitation sur les plates-formes pétrolières, les automobiles, les trains, les navires maritimes et les aéronefs est interdite.

The antenna height shall be determined by the installer or operator of the standard-power access point or fixed client device, or by automatic means. This information shall be stored internally in the device. Provision of accurate device information is mandatory.

La hauteur de l'antenne doit être déterminée par l'installateur ou l'opérateur du point d'accès à puissance standard ou de l'appareil client fixe, ou par des moyens automatiques. Ces informations doivent être stockées en interne dans l'appareil. La fourniture d'informations précises sur l'appareil est obligatoire.

# **Problems and warranty**

### **Reporting problems**

If any problems are encountered when installing or operating this equipment, follow this procedure to investigate and report:

- 1. Search this document and the software release notes of supported releases.
- 2. Visit the support website.
- 3. Ask for assistance from the Cambium product supplier.
- 4. Gather information from affected units, such as any available diagnostic downloads.
- 5. Escalate the problem by emailing or telephoning support.

### **Repair and service**

If unit failure is suspected, obtain details of the Return Material Authorization (RMA) process from the support website (http://www.cambiumnetworks.com/support).

### Hardware warranty

Cambium's standard hardware warranty is for one (1) year from date of shipment from Cambium Networks or a Cambium distributor. Cambium Networks warrants that hardware will conform to the relevant published specifications and will be free from material defects in material and workmanship under normal use and service. Cambium shall within this time, at its own option, either repair or replace the defective product within thirty (30) days of receipt of the defective product. Repaired or replaced product will be subject to the original warranty period but not less than thirty (30) days.

To register PMP and PTP products or activate warranties, visit the support website. For warranty assistance, contact the reseller or distributor. The removal of the tamper-evident seal will void the warranty.



#### Caution

Using non-Cambium parts for repair could damage the equipment or void warranty. Contact Cambium for service and repair instructions.

Portions of Cambium equipment may be damaged from exposure to electrostatic discharge. Use precautions to prevent damage.

# Security advice

Cambium Networks systems and equipment provide security parameters that can be configured by the operator based on their particular operating environment. Cambium recommends setting and using these parameters following industry recognized security practices. Security aspects to be considered are protecting the confidentiality, integrity, and availability of information and assets. Assets include the ability to communicate, information about the nature of the communications, and information about the parties involved.

In certain instances Cambium makes specific recommendations regarding security practices, however the implementation of these recommendations and final responsibility for the security of the system lies with the operator of the system.

# Warnings, cautions, and notes

The following describes how warnings and cautions are used in this document and in all documents of the Cambium Networks document set.

### Warnings

Warnings precede instructions that contain potentially hazardous situations. Warnings are used to alert the reader to possible hazards that could cause loss of life or physical injury. A warning has the following format:



#### Warning

Warning text and consequence for not following the instructions in the warning.

### Cautions

Cautions precede instructions and are used when there is a possibility of damage to systems, software, or individual items of equipment within a system. However, this damage presents no danger to personnel. A caution has the following format:



Caution

Caution text and consequence for not following the instructions in the caution.

### Notes

A note means that there is a possibility of an undesirable situation or provides additional information to help the reader understand a topic or concept. A note has the following format:



Note text.

Note

# Caring for the environment

The following information describes national or regional requirements for the disposal of Cambium Networks supplied equipment and for the approved disposal of surplus packaging.

### **In EU countries**

The following information is provided to enable regulatory compliance with the European Union (EU) directives identified and any amendments made to these directives when using Cambium equipment in EU countries.

#### **Disposal of Cambium equipment**

European Union (EU) Directive 2012/19/EU Waste Electrical and Electronic Equipment (WEEE) Do not dispose of Cambium equipment in landfill sites. For disposal instructions, refer to

https://www.cambiumnetworks.com/support/compliance/

#### **Disposal of surplus packaging**

Do not dispose of surplus packaging in landfill sites. In the EU, it is the individual recipient's responsibility to ensure that packaging materials are collected and recycled according to the requirements of EU environmental law.

### In non-EU countries

In non-EU countries, dispose of Cambium equipment and all surplus packaging in accordance with national and regional regulations.

# Chapter 1: Configuration

This chapter describes how to use the web interface to configure the 450 Platform link. This chapter contains the following topics:

- Preparing for configuration
- Connecting to the unit
- Using the web interface
- Quick link setup
- Configuring IP and Ethernet interfaces
- Upgrading the software version and using CNUT
- General configuration
- Configuring Unit Settings page
- Setting up time and date
- Configuring synchronization
- Configuring security
- Configuring 802.1X authentication
- Configuring radio parameters
- Setting up SNMP agent
- Configuring syslog
- Configuring remote access
- Monitoring the Link
- Configuring quality of service
- Citizens Broadband Radio Service (CBRS)
- Installation Color Code
- Zero Touch Configuration Using DHCP Option 66
- Configuring Radio via config file
- Configuring a RADIUS server

# Preparing for configuration

This section describes the checks to be performed before proceeding with unit configuration and antenna alignment.

# Safety precautions

All national and local safety standards must be followed while configuring the units and aligning the antennas.



#### Warning

Ensure that personnel are not exposed to unsafe levels of RF energy. The units start to radiate RF energy as soon as they are powered up. Respect the safety standards defined in Legal and Open Sources Guide, in particular the minimum separation distances.

Observe the following guidelines:

Never work in front of the antenna when the ODU is powered.

Always power down the PSU before connecting or disconnecting the drop cable from the PSU, ODU or LPU.

### **Regulatory compliance**

All applicable radio regulations must be followed while configuring the units and aligning the antennas. For more information, refer to chapter Compliance with radio regulations in Legal and Open Sources Guide.

# Connecting to the unit

This section describes how to connect the unit to a management PC and power it up.

### **Configuring the management PC**

Use this procedure to configure the local management PC to communicate with the 450 Platform ODU.

Procedure 1 Configuring the management PC

1Select Properties for the Ethernet port. In Windows 7 this is found in Control Panel > NetworkInternet > Network Connections > Local Area Connection.	
2	Select Internet Protocol (TCP/IP):

	L Local Area Connection 2 Properties
	General Authentication Advanced
	Connect using:
	Broadcom NetXtreme 57xx Gigabit C Configure
	This connection uses the following items:
	File and Printer Sharing for Microsoft Networks Network Monitor Driver Internet Protocol (TCP/IP)
	Install Uninetall Properties Description Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.
	<ul> <li>Show icon in notification area when connected</li> <li>Notify me when this connection has limited or no connectivity</li> </ul>
	OK. Cancel
3	Click Properties.
4	Enter an IP address that is valid for the 169.254.X.X network, avoiding 169.254.0.0 and 169.254.1.1. A good example is 169.254.1.3:

oerea	I manufacture of the second second	
You can get IP settings assign this capiability: Otherwise, you the appropriate IP settings.	ed automatically it your network supports need to ask your network administrator to:	
C Bblain an IP address au	omatically	
· Use the following IP add	eur	
Peddet:	169.254.1.3	
Sybret mask:	255.255.0.0	
Detault galeway:	1	
C Use the following DNS a Defended DNS rerver:	enver addressen"	
Atemate DNS server.		
	Advanced	
	OK Cancel	

### Connecting to the PC and powering up

Use this procedure to connect a management PC and power up the 450 platform ODU.

Procedure 2 Connecting to the PC and powering up

1	Check that the ODU and PSU are correctly connected.	
2	Connect the PC Ethernet port to the LAN port of the PSU using a standard (not crossed) Ethernet cable.	
3	Apply mains or battery power to the PSU. The green Power LED should illuminate continuously.	
4	After about several seconds, check that the orange Ethernet LED starts with 10 slow flashes.	
5	Check that the Ethernet LED then illuminates continuously.	

# Using the web interface

This section describes how to log into the 450 Platform Family web interface and use its menus.

# Logging into the web interface

Use this procedure to log into the web interface as a system administrator.

#### Procedure 3 Logging into the web interface

Type the IP a	ddress of the unit into t	he address bar. The factory default I	P address is 169.254.1.1
Press ENTER	. The web interface me	nu and System Summary page are di	splayed:
6			
1000			
Cam	bium Networks		
A Annual Contractor	Conserval Martin		
* Cayrate	A CONTRACTOR OF A CONTRACTOR OFTA CONTRACTOR O	AND SHOPPING AND ADDRESS OF A	
diamage .	н	ome General Status	
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and the second se		08-00-38-81-30-49	
and the second s	Deven information	and a second	
Account, none	Device Type	5.70Hz MIMO CFDM - Arcans Pant - 0x00-3ext-35-41	1
ABAN GURST	Board Tipe	P12	
and a second second second	Product Type	PMP ADD	
and the second s	Econol Ast No.	EXCEPTION APPROX	
DANOPS-	FPCA Verset	DE1716	
and the second s	FLD Version	H	
	listere	00.31.50	1
	Bytherp Tarse	09.16.17 11/10/2016 UTC	
	Main Etherner Intertace	100Bpte-TK Full Duplex	
	Hingsh Code	Savare States	4
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	Max Range	40 Miles	4
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	forta Name -	No Site Name	1
	filte Cottact :	No Sile Contact	1
	Side Location	No Site Location	1
		7109 - 199 - 200	<u></u>
1			

	Home     Copyright     Username:     admin     Password:      Login
	Account: none Level: GUEST Mode: Read-Only
4	Enter Username (factory default username is admin) and Password (factory default password is admin) and click Login.

### Web GUI



Field Name	Description	
Main Menu	Click an option in side navigation bar (area marked as "1"). Multiple options in sub- navigation bars appear	
Menu Options	Click top sub-navigation bar to choose one configuration page (area marked as "2")	
Parameters	To configure the parameters (e.g. area marked as "3")	
Save Charges	Press "Save Changes" to confirm and save the changes	

Field Name	Description
Reboot	To reboot the ODU

# Using the menu options

Use the menu navigation bar in the left panel to navigate to each web page. Some of the menu options are only displayed for specific system configurations. Use below table to locate information about using each web page.

Table 1: Menu options and web pages

Main menu	Menu options	Applicable module	Description
• Home			
G	eneral Status	All	Viewing General Status
Se	ession Status	AP, BHM	Viewing Session Status
	Event Log	All	Interpreting messages in the Event Log
Net	work Interface	All	Viewing the Network Interface
Lay	er 2 Neighbors	All	Viewing the Layer 2 Neighbors
Configuration			
	General	All	General configuration
	IP	All	Configuring IP and Ethernet interfaces
Radio		All	Configuring radio parameters
SNMP		All	Setting up SNMP agent
	cnMaestro	All	Configuring cnMaestroTM Connectivity
Quality	of Service (QoS)	All	Configuring quality of service
	Security	All	Configuring security
	Time	AP, BHM	Setting up time and date
	VLAN	All	VLAN configuration for PMP
			VLAN configuration for PTP
	DiffServ	All	IPv4 and IPv6 Prioritization
Protocol Filtering		All	Filtering protocols and ports
	Syslog	All	Configuring syslog
Ping Watchdog		All	Configuring Ping Watchdog

Main menu	Menu options	Applicable module	Description
	Unit Setting	All	Configuring Unit Settings page
Statistics			
Schedul	er	All	Viewing the Scheduler statistics
	Registration Failures	АР, ВНМ	Viewing list of Registration Failures statistics
	Bridge Control Block	All	Interpreting Bridge Control Block statistics
	Bridging Table	All	Interpreting Bridging Table statistics
	Ethernet	All	Interpreting Ethernet statistics
	Radio	All	Interpreting RF Control Block statistics
	VLAN	All	Interpreting VLAN statistics
	Data Channels	All	Interpreting Data Channels statistics
	MIR/Burst	AP, SM	Interpreting MIR/Burst statistics
	Throughput	AP, BHM	Interpreting Throughput statistics
	Filter	All	Interpreting Filter statistics
	ARP	All	Viewing ARP statistics
	Overload	All	Interpreting Overload statistics
	Syslog Statistics	All	Interpreting syslog statistics
	Translation Table	SM	Interpreting Translation Table statistics
	DHCP Relay	AP	Interpreting DHCP Relay statisticson page 1
	NAT Stats	SM	Viewing NAT statistics
	NAT DHCP	SM	Viewing NAT DHCP Statistics
	Pass Through Statistics	AP	Interpreting Pass Through Statistics
	Sync Status	AP	Interpreting Sync Status statistics
	PPPoE	SM	Interpreting PPPoE Statistics for Customer Activities
	SNMPv3 Statistics	All	Interpreting SNMPv3 Statistics
	Frame Utilization	AP, BH	Interpreting Frame Utilization statistics
Tools			

Main menu	Menu options	Applicable module	Description
	Link Capacity Test	All	Using the Link Capacity Test tool
	Spectrum Analyzer	All	Spectrum Analyzer tool
	Remote Spectrum Analyzer	All	Remote Spectrum Analyzer tool
	АР/ВНМ	SM, BHS	Using AP Evaluation tool
	Evaluation		Using BHM Evaluation tool
	Subscriber Configuration	AP	Using the Subscriber Configuration tool
	OFDM Frame Calculator	All	Using the OFDM Frame Calculator tool
	BER results	SM, BHS	Using BER Results tool
	Alignment Tool	SM, BHS	Using the Alignment Tool
	Link Status	All	Using the Link Status tool
	Sessions	AP, BHM	Using the Sessions tool
	Ping Test	All	Using the Ping Test tool
• Lo	ogs		
• Ac	counts		
	Change User Setting	All	Changing a User Setting
	Add user	All	Adding a User for Access to a module
	Delete User	All	Deleting a User from Access to a module
	User	All	Users account
Quick Start			
	Quick Start	AP, BHM	Quick link setup
	Region Settings	AP, BHM	Quick link setup
	Radio Carrier Frequency	АР, ВНМ	Quick link setup

Main menu	Menu options	Applicable module	Description
	Synchronization	AP, BHM	Quick link setup
	LAN IP Address	AP, BHM	Quick link setup
	Review and Save Configuration	АР, ВНМ	Quick link setup
PDA			
	Quick Status	SM	The PDA web-page includes 320 x 240 pixel formatted displays of information important to installation and alignment for installers using legacy PDA devices. All device web pages are compatible with touch devices such as smart phones and tablets.
	Spectrum Results (PDA)	SM	
	Information	SM	
	BHM Evaluation	SM	
	AIM	SM	
Copyright			
	Copyright Notices	All	The Copyright web-page displays pertinent device copyright information.
Logoff		All	

# **Quick link setup**

This section describes how to use the Quick Start Wizard to complete the essential system configuration tasks that must be performed on a PMP/PTP configuration.

# **Initiating Quick Start Wizard**



To start with Quick Start Wizard: after logging into the web management interface click the Quick Start button on the left side of main menu bar. The AP/BHM responds by opening the Quick Start page.

#### Figure 3: Disarm Installation page (top and bottom of page shown)



Quick Start is a wizard that helps you to perform a basic configuration that places an AP/BHM into service. Only the following parameters must be configured:

- Region Code
- RF Carrier Frequency
- Synchronization
- LAN (Network) IP Address

In each Quick Start page, you can

- specify the settings to satisfy the requirements of the network.
- review the configuration selected.
- save the configuration to non-volatile memory.

#### Procedure 4 Quick start wizard

1	At the bottom of the Quick Start tab, click Go To Next Page .				
2	From the pull-down menu, select the region in which the AP will operate.				
	Figure 4: Regional Settings tab of AP/BHM				
	Region Settings Desc To comply with various transmit unless a valid	riptions s internation region code	al regu e is set.	ulations, a region setting is required. This unit will NOT t. Please select your region code from the drop down	
--	---	---	---	---	--
	menu. If your region a	oes not app	ear, the		
	Region Settings				
	Region :		O	Dther - Regulatory ▼	
	Country :		O	Dther - FCC 🔻	
		<=Go T	o Previo	ious Page   Go To Next Page=>	
3	Click the Go To Next Pa	age button.			
4	From the pull-down me	enu, select a	freque	ency for the test.	
	Figure 5: Radio Carrier	Frequency	tab of ,	AP/BHM	
	Radio Carrier Frequency			Ξ.	
	To communicate, each must be assigned a spe set at the factory to ens unintended frequency. platforms has two basic 1. Two radios located same frequency she 2. Generally for PMP - 3.5/3.65 GHz platfo Channel Support" is 5/3/2 MHz for 20/10 5/5/2.5 MHz guard 1 We recommend multip where convenient. For twice with the back-to-b Please see the Canopy	Access Point (A ecific carrier freq sure that new un For our purpose crules: at a single locati pould not have an 450, no guard be rm, which can al senabled. Other 1/5 MHz channel band is required oint AP clusters a 360 degree m pack units sharin v User's Guide or	P) and B: uency. By its do not s, frequer on (such : overlappi and is nee so operativise 3.5/3 bandwidt for 20/10 use frequi utipoint A g the sam	Sackhaul (BH) timing master ly default, this frequency is not t accidentally transmit on an ency selection for OFDM as an AP cluster) and on the ping pattern. eded. With the exception of the with no guard band if "Adjacent (3.65 will need a guard band of this. For PMP 430 and PTP 230, 0/5 MHz channels bandwidths. uencies separated by 15 MHz AP, each frequency is used me frequency. the latest information.	
	Access Point	Frequency	ID	Symbol A B	
	Northeast	5495 MHz	1	BA	
	Southeast	5545 MHz	2		
	Southwest	5495 MHz	1	A	
	Northwest	5545 MHz	2	B	
AP Carrier Frequency Parameter Please select Carrier Frequency from 5490.0 • the list : <pre></pre>					
5	Click the Go To Next Pa	age button.			
6	At the bottom of this ta Figure 6: Synchronizat	ab, select Ge <i>ion tab of A</i>	enerate P/BHM	e Sync Signal. প	

	Synchronization =
	When any radio transmits, it radiates energy, if a nearby radio is trying to receive at the same time another is transmitting, interference can result. One of the mechanisms used by Canopy to avoid this issue is to synchronize all transmissions. This approach ensures that all Canopy units will transmit and receive during the same time interval.
	To accomplish this, Canopy Cluster Management Module's (CMM) each contain a GPS receiver. This receiver is used to create a precision timing signal which is then used by the attached APs/BHs (Backhauls). For systems that have only one AP/BH, this signal can be generated by selecting "Generate Sync" which causes AP/BH to use a simulated synchronization. For systems that have multiple APs/BHs, GPS synchronization should be used.
	Each AP or BH timing master (BHM) must be programmed to either generate its own synchronization pulse (for single AP/BHM use only) or to use an external pulse. If you are using a CMM or other source of synchronization timing, you should select "AutoSync"; if not, you should select "Generate Sync". There are three methods on the AP/BHM from which the synchronization is received 1/Power Port (Not applicable for PTP450) 2/Timing Port 3/On-board GPS (PMP 450 AP only) If the power port is being used, only one cable is necessary to obtain power and the synchronization pulse. If the timing port is used, two cables will be necessary, one to obtain power and the other for the synchronization pulse.
	Selecting "AutoSync + Free Run" will allow the AP/BHM to continue to transmit even after the sync pulse is lost. Otherwise if "AutoSync" is selected and synchronization pulse is lost, the AP/BHM will immediately stop transmitting. This is done to prevent interference with other Canopy systems.
	Please be aware that operating multiple APs/BHs without an external GPS timing source may lead to degraded system operation.
	Also, use the Frame Calculator tool for complete transmit and receive synchronization across different Canopy products
	Synchronization Parameters
	(Synchronization Senerate Sync
,	Click the Go To Next Page button.
3	At the bottom of the IP address configuration tab, either
	<ul> <li>specify an IP Address, a Subnet Mask, and a Gateway IP Address for management of the AP and leave the DHCP state set to Disabled.</li> </ul>
	<ul> <li>set the DHCP state to Enabled to have the IP address, subnet mask, and gateway IP address automatically configured by a domain name server (DNS).</li> </ul>
	Figure 7: LAN IP Address tab of the AP/BHM

LAN IP Addre	:55					
The II order this p with ti Each traffic You ir below If you	P address of the Ca to monitor, update, age (which you app he Canopy AP/BH to network has its own between network e beed to select the IP itend to use to com to don't know what th	anopy AP/BH timing ma and manage the Cano ear to be doing now), y using this IP address. In collection of IP address elements such as APs, IP address, Default Gate municate with the AP/B ese are, please consult	ister is used to ta py system. If you our browser is co ases that are use BHs, Routers, ar way, and Netwo H timing master your local netwo	lik to the unit in u are viewing ommunicating of to route of Computers. rk Mask which in the space ork specialist.		
LAN1 Networ	rk Interface Configu	ration				
IP Address :		10.110.65.90				
Subnet Mask	:	255,255,255.0				
Gateway IP A	ddress :	10.110.65.254				
DHCP state :		<ul> <li>Enabled</li> <li>Disabled</li> </ul>				
DHCP DNS IF	P Address :	Obtain Automatically     Set Manually				
Preferred DN	S Server :	10.110.12.31				
Alternate DNS	S Server :	10.110.12.30				
Domain Name	8 C	pool.ntp.org				
P	Note Cambium enco configuration a changes are af	ourages you to expe and reboot the AP a fected.	riment with th fter you save	ne interface. Un the configurati	nless you save ion, none of the	a e
Click the Go	o To Next Page b	outton.				
Ensure that	the initial param	neters for the AP ar	e set as you in	tended.		
Figure 8: R	eview and Save	Configuration tab c	f the AP/BHM	1		

Review and Save Configuration	E.
The narameters below refle	of the selections you have made. From here, you
may:	to the anticipation you marter market, you
Change any	parameter
Save the pa	arameters to non-volatile memory
Undo all cho	ances since the unit was last reset.
Reset all set	tions to their factory default values
Behost the	ing in the second s
Postores the	
It is important to know that i unit will take effect until the unit is ready to go!	no configuration changes you make to the Canopy unit is rebooted. Once you reboot, your Canopy
AP Carrier Frequency Parameter	
from the list :	5490.0 *
Region Settings	Chev. Respiritor 4
Negion :	Citier - Hegulatory *
Country :	UTRE T
Synchronization Parameters	
Synchronization :	Generale Sync 🔹
A AMI Maharak Interferen Continue	
DANT Network Interface Configura	500 m
Suboal Mask	0.326.336.336.336.336.336.336.336.336.336
Gateway IP Address	10 110 46 264
Galendy IP Matress .	0 Enabled
DHCP state :	# Disabled
DHCP DNS IP Address :	Obtain Automatically     Set Manually
Preferred DNS Server :	10.110.12.31
Alternate DNS Server :	10.110.12.30
Domain Name :	pool rdp.org
11-3 MEds Observes	
Undo Unit-Wide	Saved Changes Set to Factory Defaults
	<ul> <li>KuGo To Previous Page</li> </ul>
	Rais Channes
	and the feet of the second s
	Rebot
Click Save Changes bu	utton.
Click the Reboot butto	on.
RESULT. The AP resu	onds with the message Reboot Has Reen Initiated
REGOLI. THE AT TESP	
Wait until the indicato	r LEDs are not red.
Trigger your browser	to refresh the page until the AP redisplays the General Status tab.

# Configuring time settings

To proceed with the test setup, click the Configuration link on the left side of the General Status page. When the AP responds by opening the Configuration page to the General page, click the Time tab.

#### Figure 9: Time tab of the AP/BHM

	E August Barris Barris Marca	
NTP Server (Name or IP Address)	<ul> <li>Append LNIS Domain Name</li> <li>Disable DNS Domain Name</li> </ul>	
NTP Server 1 (Name or IP Address)	0000	
NTP Server 2 (Name or IP Address)	0000	
NTP Server 3 (Name or IP Address) :	0.000	
NTP Server(s) In Use	No NTP Server Configured	
Current System Time		
Time Zone	(UTC) Coordinated Universal Time	÷
System Time	11.04.03 11/19/2020 UTC	
Last NTP Time Update :	10 59 48 11/19/2020 UTC	
Allow GPS to set System Time :	Enabled	
Time and Date		-
Time	10 22 43 UTC	
Date	11 / 15 / (2020 Set Time and Date	
NTP Update Log		
and shirt and		

To have each log in the AP/BHM correlated to a meaningful time and date, either a reliable network element must pass time and date to the AP/BHM or you must set the time and date whenever a power cycle of the AP/BHM has occurred. A network element passes time and date in any of the following scenarios:

- A connected CMM4 passes time and date (GPS time and date, if received).
- A separate NTP server is addressable from the AP/BHM.

If the AP/BHM should obtain time and date from a CMM4, or a separate NTP server, enter the IP address of the CMM4 or NTP server on this tab. To force the AP/BHM to obtain time and date before the first (or next) 15-minute interval query of the NTP server, click Get Time through NTP.

If you enter a time and date, the format for entry is:

Figure 10: Time and date entry formats

Time:	hh	/	mm	/	SS
Date:	ММ	/	dd	/	уууу

where

hh	represents the two-digit hour in the range 00 to 24
----	---

# **Configuring IP and Ethernet interfaces**

This task consists of the following sections:

- Configuring the IPv4 interface
- NAT, DHCP Server, DHCP Client and DMZ
- IP interface with NAT disabled SM
- IP interface with NAT enabled SM
- NAT tab with NAT disabled SM
- NAT tab with NAT enabled SM
- NAT DNS Considerations SM
- DHCP BHS
- VLAN configuration for PMP
- VLAN page of AP
- VLAN page of SM
- VLAN Membership tab of SM
- VLAN configuration for PTP
- NAT Port Forwarding tab SM

# Configuring the IPv4 interface

The IPv4 interface allows users to connect to the 450 Platform Family web interface, either from a locally connected computer or from a management network.

Applicable	PMP:	þ	AP	þ	SM	PTP:	þ	BHM	þ	BMS
products										

To configure the IP interface, follow these instructions:

#### Procedure 8 Configuring the AP/BHM IPv4 interface

1 Select menu option **Configuration > IP**. The LAN configuration page is displayed:

	109.204.1.1	
Subnet Mask :	255.255.0.0	
Gateway IP Address :	169.254.0.0	
DHCP state :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	
DNS IP Address :	Obtain Automatically Set Manually	
Preferred DNS Server :	0.0.0.0	
Alternate DNS Server :	0.0.0	
Domain Name :	example.com	
I AN2 Network Interface Configura	tion (Radio Private Interface - Must end in 1)	
IP Address '	192.168.101.1	
Update IPv4 Address, Subnet specified by the network adm Review the other IP interface Click Save. "Reboot Required"	Mask and Gateway IP Address to meet network req inistrator). attributes and update them, if necessary (see ). ' message is displayed:	uirements
Update IPv4 Address, Subnet specified by the network adm Review the other IP interface Click Save. "Reboot Required"	Mask and Gateway IP Address to meet network req inistrator). attributes and update them, if necessary (see ). " message is displayed:	uirements
Update IPv4 Address, Subnet specified by the network adm Review the other IP interface Click Save. "Reboot Required"	Mask and Gateway IP Address to meet network req inistrator). attributes and update them, if necessary (see ). ' message is displayed:	uirements
Update IPv4 Address, Subnet specified by the network adm Review the other IP interface Click Save. "Reboot Required" LAN1 Network Interface Configur IP Address Subnet Mask	Mask and Gateway IP Address to meet network requisitrator). attributes and update them, if necessary (see ). ' message is displayed: align 169 254 1 2 255 255 0 0	uirements
Update IPv4 Address, Subnet specified by the network adm Review the other IP interface Click Save. "Reboot Required" LAN1 Network Interface Configur P Address Subnet Mask Gateway IP Address	Mask and Gateway IP Address to meet network requinistrator). attributes and update them, if necessary (see ). ' message is displayed: illin 169 254 1 2 255 255 0 0 169 254 0 0	uirements
Update IPv4 Address, Subnet specified by the network adm Review the other IP interface Click Save. "Reboot Required" Click Save. "Reboot Required"	Mask and Gateway IP Address to meet network requisitrator). attributes and update them, if necessary (see ). " message is displayed: align 169 254 1 2 255 255 0 0 169 254 0 0 C Enabled C Disabled	uirements
Update IPv4 Address, Subnet specified by the network adm Review the other IP interface Click Save. "Reboot Required" LANT Network Interface Configur IP Address Subnet Mask: Gateway IP Address DHCP state DNS IP Address :	Mask and Gateway IP Address to meet network requisitrator). attributes and update them, if necessary (see ). ' message is displayed: align 169 254 1 2 255 255 0 0 169 254 0 0 C Enabled C Enabled C Enabled C Enabled C Set Manually C Set Manually	uirements
Update IPv4 Address, Subnet specified by the network adm Review the other IP interface Click Save. "Reboot Required" LANT Network Interface Configur IP Address Subnet Mask Gateway IP Address DHCP state DNS IP Address Preferred DNS Server	Mask and Gateway IP Address to meet network requisitrator). attributes and update them, if necessary (see ). ' message is displayed: idion 169 254.1.2 255 255 0.0 169 254.0 169 254.0 0 6 Enabled 0 Obtain Automatically 5 Set Manually 0 0.0	uirements
Update IPv4 Address, Subnet specified by the network adm Review the other IP interface Click Save. "Reboot Required" Click Save. "Reboot Required" Pathwark Interface Configure P Address Subnet Mask: Click Save. "Reboot Required" P Address DHCP state DNS IP Address Protemed DNS Server Atternate DNS Server	Mask and Gateway IP Address to meet network requisitrator). attributes and update them, if necessary (see ). " message is displayed: alion 169 254 1 2 255 255 0 0 159 254 0 0 C Enabled C Enabled C Disabled C Set Manually D 0 0 0	uirements

The IP page of AP/SM/BHM/BHS is explained in below table.

Figure 12: IPv4 interface attributes

LAN1 Network Interface Configuration					
IP Address :	10.110.245.135				
Subnet Mask :	255.255.255.0				
Gateway IP Address :	10.110.245.254				
DHCP state :	© Enabled © Disabled				
DHCP DNS IP Address :	<ul> <li>Obtain Automatically</li> <li>Set Manually</li> </ul>				
Preferred DNS Server :	10.110.12.30				
Alternate DNS Server :	10.110.12.31				
Domain Name :	example.com				

### Advanced LAN1 IP Configuration

Default alternative LAN1 IP address :

Enabled
 Disabled

Aux Ethernet Port	E
AUX Ethernet Port :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>
AUX Ethernet Port PoE :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>
	Reset AUX PoE

# LAN2 Network Interface Configuration (Radio Private Interface - Must end in .1) IP Address : 192.168.101.1

Attribute	Meaning
IP Address	Internet Protocol (IP) address. This address is used by family of Internet protocols to uniquely identify this unit on a network.
Subnet Mask	Defines the address range of the connected IP network.
Gateway IP Address	The IP address of a computer on the current network that acts as a gateway. A gateway acts as an entrance and exit to packets from and to other networks.
DHCP state	If Enabled is selected, the DHCP server automatically assigns the IP configuration (IP address, subnet mask, and gateway IP address) and the values of those individual parameters (above) are not used. The setting of this DHCP state parameter is also viewable (read only), in the Network Interface tab of the Home page.

Attribute	Meaning		
DNS IP Address	Canopy devices allow for configuration of a preferred and alternate DNS server IP address either automatically or manually. Devices must set DNS server IP address manually when DHCP is disabled for the management interface of the device. DNS servers may be configured automatically from the DHCP response when DHCP is enabled for the management interface of the devices may be configured to set the DNS server IP address manually when DHCP is enabled for the device. DNS servers may be configured to set the DNS server IP address manually when DHCP is enabled for the management interface. The default DNS IP addresses are 0.0.0.0 when configured manually.		
Preferred DNS Server	The first address used for DNS resolution.		
Alternate DNS Server	If the Preferred DNS server cannot be reache	ed, the Alterna	te DNS Server is used.
Domain Name	The operator's management domain name may be configured for DNS. The domain name configuration can be used for configuration of the servers in the operator's network. The default domain name is example.com, and is only used if configured as such.		
Advanced LAN1 IP Configuration – Default alternate LAN1 IP address	Hardcoded default alternate IP address (169.254.1.1) that is available only when connected to the Ethernet port. When enabled, user can configure a second IP address for the bridge which is other than the hardcoded IP address (169.254.1.1).		
AUX Ethernet	Enabled: Data is enabled for Auxiliary port		
Port – AUX Ethernet Port	Disabled: Data is disabled for Auxiliary port		
AUX Ethernet	Enabled: PoE out is enable for Auxiliary port		
Port – AUX Ethernet Port PoE	Disabled: PoE out is disabled for Auxiliary port		
LAN2 Network Interface Configuration (Radio Private Interface) – IP Address	It is recommended not to change this parameter from the default AP/BHM private IP address of 192.168.101.1. A /24 CIDR subnet is used to communicate with each of the SMs/BHS that are registered. The AP/BHM uses a combination of the private IP and the LUID (logical unit ID) of the SM/BHS. It is only displayed for AP and BHM. Table 3: SM/BHS private IP and LUID		
	SM/BHS	LUID	Private IP
	First SM/BHS registered	2	192.168.101.2
	Second SM registered	3	192.168.101.3
1			

### **Configuring the IPv6 interface**

The IPv6 interface allows users to connect to the 450 Platform Family web interface, either from a locally connected computer or from a management network.

To configure the IPv6 interface, follow these instructions:

#### Configuring the AP/BHM IPv6 interface

To enable this feature,

- 1. Go to Configuration > IP > LAN1 IPv6 Network Interface Configuration.
- 2. Set the **IPv6** parameter as Enabled.

LAN1 IPv6 Network Interface Cor	nfiguration	
IPv6	Enabled	
IPv6 Address :		
Prefix Length :	64	
Gateway IPv6 Address :	E	
Preferred DNS Server :		
Alternate DNS Server :	C	
DHCPv6	Enabled     Enabled	

3. Once IPv6 is enabled and the device is rebooted, the device generates a link-local IPv6 address using the EUI-64 format.

When the IPv6 feature is enabled, the IPv6 LAN interface addresses are displayed on **General > Network Interface** page of the radio GUI.

LAN1 IPv6 Network Interface		10
Global IPv6 Address	FD01: 1111 123 (Static)	
Link Local IPv6 Address :	FE80 A00 3EFF FEBB 7945	
Gateway IPv6 Address	FE80: 2	
Primary DNS IPv6 Address	2620 119 35 35	
Secondary DNS IPv6 Address	2620 119 53 53	
DHCPv6 status	Disabled	
Multicast Addresses	FF02 1 FF11 123 FF02 1 FF02 1 FF88 7045	

Once the Stateless Auto Address Configuration (SLAAC) IP is received, Network Interface page is updated with most recent SLAAC IP address and gateway information as follows:

LAN1 IPv6 Network Interface		1
Global IPv6 Address	FD01_A00 3EFF FEBB 7945 (SLAAC)	
Link Local IPv6 Address	FE80: A00 3EFF FEB8 7945	
Gateway IPv6 Address :	FE80 2	
Primary DNS IPv6 Address		
Secondary DNS IPv6 Address		
DHCPv6 status :	Disabled	
Multicast Addresses	FF02: 1 FF02: 1 FFBB:7945	

### **IPv6 Trap Addresses**

Go to **Configuration > SNMP > IPv6 Trap Addresses** of radio to configure a maximum of five IPv6 trap addresses. Any changes made to the IPv6 Trap Addresses requires a reboot.

Pv6 Trap Addresses		
Trap Address 1	FD91: ABCD 1	1
Trap Address 2	-	
Trap Address 3		
Trap Address 4 :		
Trap Address 5		1

### **IPv6 Statistics**

Go to Statistics > IPv6 MIB Statistics of radio to view the IPv6 and ICMPv6 MIB statistics.

IPv6 MIB Statistics	E
Forwarding:2	
DefaultHopLimit:0	
Interfaces:0	
IfTableLastChange:0	
RouteNumber:0	
DiscardedRoutes:0	
IptinPkts.849	
ipblinErrs.18	
ipoinDrops:0	
IpelinUnknown:0	
IpoCuIPKIS:1093	
ipoOutens.0	

ICMPv6 MiB Statistics	(第
ICMPv6 MIELSINItations ICMPv6 stats for face et0 InMsgs 17 InErrors 0 InDestUnreachs 0 InAdminProhibs 0 InTimeExcds 0 InParmProblems 0 InPetTooBigs 0 InEchoRopiles 0 InRouterSolicits 0 InRouterSolicits 5 InNeighborSolicits 5 InNeighborSolicits 5 InNeighborSolicits 5 InNeighborSolicits 5 InNeighborSolicits 5 InNeighborSolicits 5 InNeighborSolicits 5 InNeighborSolicits 5 InNeighborSolicits 5 InRedirects 0 InGroupMembResponses 0 InGroupMembResponses 0 InGroupMembReductions 0 OutEntors 0 OutEntors 0 OutEntors 0 OutParmProblems 0 OutParmProblems 0 OutParmProblems 0 OutEchoReplies 0 OutEchoReplies 0 OutEchoReplies 0 OutEchoReplies 0 OutEchoReplies 0 OutEchoReplies 0 OutEchoReplies 0	
OutDestUnreachs 0 OutAdminProhibs 0 OutTimeExcds 0 OutParmProblems 0 OutPktTooBigs 0	
OutEchoRopies 0 OutEchoRopies 0 OutRouterAdvertisements 0 OutReighborSolicits 12 OutNeighborAdvertisements 5 OutReighborAdvertisements 5	
OutGroupMembQuenes:0 OutGroupMembResponses:0 OutGroupMembReduction:0	

### **IPv6 Neighbor Discovery Cache**

Go to Statistics > IPv6 Neighbor Discover Cache of the AP/SM GUI to view Neighbor Discovery Cache.

interface	Pending	IPv6 Address	State	Timeout	MAC Address
et0	n	2620 119 35:35	NDS_STALE	4294967273	38-0e-4d-8b-08-b2
et0	8	FE80.2	NDS_STALE	174268	38-0e-4d-8b-08-b2
et0	n	FE80 C476 56E9 3E90 DCF7	NDS REACHABLE	4294967003	8c-ec-4b-ec-50-e4



### Note

The IPv6 feature is supported with HTTP, HTTPS, SSH, Telnet, SNMPv2c, and SNMPv3 application protocols.

### **IPv6 Ping Test**

To perform IPv6 ping test,

- 1. Go to Tools > Ping Test > Ping IPv6 Test Settings of the radio.
- 2. Configure the IPv6 Address parameter

- 3. Configure the **Count** parameter with any value from 3 to 64.
- 4. Click Perform Ping v6 Test. The IPv6 ping test results are displayed under Ping IPv6 Test Results.

Ping IPv6 Test Settings		E.	
IPv6 Address :	FD01::A00:3EFF:FEB8:427E		
Count :	3		
	Perform Ping v6 Test		
Direct D. & Tool December			
Ping IPvo lest Results		<u>_</u>	
ping6, sending 3 pings of 64 byte length to FD01::A00:3EFF:FEBB:427E			
Sent ping; sess: 0, Seq: 1 to FD01::A00:3EFF:FEBB:427E			
ping6 reply for session 0 (seq. 0) [FD01::A00:3EFF:FEBB:427E]			
Sent ping, sessi 0, Seq. 2 to FD01: A0013EFF/FEBB/427E			
pinglo reply for session 0 (seq. 1) (FL01_AUU_3EFF;FEBS,427E)			
Sent ping, sessi 0, Seq: 310 FD01: A00 3EFFFEBB/427E			
pingto repry tor session 0 (seq. 2) (FD01_A00.3EFF.FEBD.427E)			
End of session 0, sent 3, recv.3			

### DHCPv6

DHPCv6 can either be enabled explicitly or can be enabled when radio receives **Managed** bit set in Router Advertisement (RA).

DHCPv6 Status can be: Disabled/Enabled (explicitly enabled) or Managed (DHCPv6 enabled due to M-bit been set in RA).

LAN1 IPv6 Network Interface		
Giobal IPv6 Address	FD01 2046 2917 458E C322 (DHCPv6)	
Link Local IPv6 Address	FE80: A00:3EFF FEB8 7945	
Gateway IPv6 Address :	FE80.2	
Primary DNS IPv6 Address	2620 119 35 35	
Secondary DNS IPv6 Address	2620 119 53 53	
DNS Suffix Search List	cembiumnetworks.com	
DHCPv6 status	Managed Lease Remaining 00 14 39 Release Remov	
DHCPv6 IAID :	01bb7945	
DHCPv6 Client BUID	00-03-00-01-0a-00-3e-bb-79-45	
Multicast Addresses	FF02 1 FF8E C322 FF02 1 FF02 1 FF88 7945	

#### **AP Statistics:**

When this feature is enabled a new statistics page is available on the AP GUI. To access this page,

Go to Statistics > DHCPv6 Stastistics.

DHCPv6 Statistics	
DHCPv6 stats for flace et0	
Solicit 2	
Advertise: 2	
Request 2	
Confirm 0	
Renew 4	
Rebind: 0	
Reply 7	
Release 1	
Decline: 0	
Reconfigure 0	
Information Request 0	
Relay Forward. 0	
Relay Reply: 0	

#### DHCPv6 Relay Agent

DHCPv6 relay agent currently supports **Inserting Option 82** only. **Full Relay Operation** mode is currently not supported with DHCPv6. DHCP Relay Agent configuration is common for both DHCPv4 and DHCPv6.

DHCP Relay Agent	
DHCP Relay Agent :	Enable - Only Insert Option 82
DHCP Server (Name or IP Address) :	Append DNS Domain Name - Disable DNS Domain Name 265.255.255.255
Option 82 Circuit ID :	Sagmact/S
Option 82 Remote ID :	Sevenachia
Option 82 Vendor Specific ID :	Same:S
Note: DHCPv6 relay is supported only in "Ins-	ert Option 82" mode

DHCPv4 Option 82 sub-options are mapped to DHCPv6 options as follows:

DHCPv4 sub options	DHCPv6 options
Sub option 1 (Agent Circuit-ID)	Option 18 (Interface-ID)
Sub option 2 (Agent Remote-ID)	Option 37 (Remote-Identifier)
Sub option 2 (Agent Remote-ID)	Option 37 (Remote-Identifier)
Sub option 9 (Vendor Specific information)	Option 17 (Vendor Specific information)
	Note Sub option is replaced with encapsulated vendor specific option, option ID '1'.
	Option 16 (vendor Class) will have radio model information, for example: <b>Cambium PMP 450 AP</b> .

Following is an example of **Statistics > DHCP Relay** page:

DHCPv6 Relay Statistics	
Requests Received :	9
Requests Relayed :	9
Requests Discarded :	0
Replies Received :	0
Replies Relayed :	0
Replies Discarded :	0
Relay Info Exceeding Max Message Size (DHCPv6 message relayed without Option 82) :	0

Bubernber	LUID		Cacuit ID Sapmachill	Pennite ID Simmaids#	Vonder Specific ID Bernard
					Binary Option 82 Data
		tinary	Os0COes2edd2	Dx003es13114	000000e10e13080108326e6420534a
Died Stat	002	ASON		Section of the	2nd SM
ALLER MALL	1	Full Option 82 Binary Data	522101060±003e	abed:202060a003e	(131140904000000a10a13080108326e6420534c
		Briary	0x000ea7edd2	0x003xb1bx3x	000000a110130e010e4e6/2053697468204e616365
And Minist Stations.	1000	ASOI			No Ste Norre
No see teatre		Full Option 82 Binary Dela	822701060a003e	=2+05202060+003+	17x2a2915000004110130x010x4x802053897485204

#### **DNSv6**

DNS information can be obtained 3 different ways in IPv6:

- 1. Router Advertisement support DNS information as mentioned by <u>RFC 8106</u>. If the router sends DNSv6 information, radio will display on Network Interface page.
- 2. **Stateless DHCPv6**: In this scenario Router Advertisement won't send any DNS information but will set O-bit. Radio will initiate a DHCPv6 Information Request transaction (<u>RFC 8415</u>) and fetch the DNS information from server.
- 3. **Stateful DHCPv6**: Router Advertisement will be sent with M-bit set, Radio will initiate a complete DHCPv6 transaction to obtain IPv6 address and DNSv6 information.

LAN1 IPv6 Network Interface		B
Global IPv6 Address :	FD01::2046:2917:458E:C322 (DHCPv6)	
Link Local IPv6 Address :	FE80::A00:3EFF:FEBB:7945	
Gateway IPv6 Address :	FE80::2	
Primary DNS IPv6 Address :	2620.119.35:35	
Secondary DNS IPv6 Address :	2620:119:53::53	
DNS Suffix Search List :	cambiumnetworks.com	

Maximum two DNS IPv6 servers are supported. If there is a static entry configured, it will be overridden with received value.



### Note

Currently we only support vendor options DNS Recursive Name Serve and DNS Suffix Search List.

#### **DNS IPv6 Resolution**

DNS test tool can be used to resolve IPv6 address for Fully Qualified Domain Name (FQDN) using **DNS IPv6 Lookup**.

DNS Test Settings		E
Fully Qualified Domain Name :	www.google.com	
	Perform DNS Lookup	
l	Perform DNS IPv6 Lookup	
DNR Test Bosuits		
DNS Test Results		=
www.google.com resolves to: 2404:6800:40	09:800::2004	

The IPv6 page of AP/SM/BHM/BHS is explained in below table.

Figure 13: IPv6 interface attributes

n	
10.110.215.234	
255.255.250.0	
10 110.215.254	
Enabled * Disabled	
<ul> <li>Obtain Automatically</li> <li>* Set Manually</li> </ul>	
0.0.0	
0.0.0	
example.com	
	10.110.215.234 255.255.250.0 10.110.215.254 Enabled Disabled Obtain Automatically Set Manually 0.0.0 0.0.0 example.com

LAN1 IPv6 Network Interface Configuration		
IPv6 ;	* Enabled	
IPv6 Address :	F001.234	
Prefix Length :	64	
Gateway IPv6 Address :		
Preferred DNS Server :	ED01-35	
Alternate DNS Server :	FD01 36	1
DHCPv6 :	# Enabled Disabled	

### Advanced LAN1 IP Configuration

and a second second state of the second s		
Default alternative LAN1 IP address :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	

LAN1 IPv6 Network Interface Cor	figuration	
IPv6 :	* Enabled Disabled	
IPv6 Address :		
Prefix Length :	64	
Gateway IPv6 Address :	÷	
Preferred DNS Server :	1	
Alternate DNS Server :		
DHCPv6 :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	

Default alternative LAN1 IP address :	Enabled     Disabled
Aux Ethernet Port	
AUX Ethernet Port :	<ul> <li>Enabled</li> <li>Disabled</li> <li>Please Note:</li> <li>Enabling the Aux Ethernet port will disrupt the Aux Power to UGPS</li> </ul>
AUX Ethernet Port PoE :	© Enabled * Disabled
	Reset AUX PoE

LAN2 Network Interface Configuration (Radio Private Interface - Must end in .1) IP Address : 182 168 101 1

Attribute	Meaning
IP Address	Internet Protocol (IP) address. This address is used by family of Internet protocols to uniquely identify this unit on a network.
Subnet Mask	Defines the address range of the connected IP network.
Gateway IP Address	The IP address of a computer on the current network that acts as a gateway. A gateway acts as an entrance and exit to packets from and to other networks.
DHCP state	If Enabled is selected, the DHCP server automatically assigns the IP configuration (IP address, subnet mask, and gateway IP address) and the values of those individual parameters (above) are not used. The setting of this DHCP state parameter is also viewable (read only), in the Network Interface tab of the Home page.
DHCP DNS IP Address	Canopy devices allow for configuration of a preferred and alternate DNS server IP address either automatically or manually. Devices must set DNS server IP address manually when DHCP is disabled for the management interface of the device. DNS servers may be configured automatically from the DHCP response when DHCP is enabled for the management interface of the devices may be configured to set the DNS server IP address manually when DHCP is enabled for the management interface. The default DNS IP addresses are 0.0.0.0 when configured manually.
Preferred DNS Server	The first address used for DNS resolution.
Alternate DNS Server	If the Preferred DNS server cannot be reached, the Alternate DNS Server is used.
Domain Name	The operator's management domain name may be configured for DNS. The domain name configuration can be used for configuration of the servers in the operator's network. The default domain name is example.com, and is only used if configured as such.
IPv6	Provision to Enable/Disable IPv6 option.
IPv6 Address	Internet Protocol version 6 (IPv6) address. This address is used by family of Internet protocols to uniquely identify this unit on a network.

Attribute	Meaning			
Prefix Length	Displays the number of leading bits in the prefix that are valid (from 0 to 128 bits).			
Gateway IPv6 Address	This field displays the gateway IPv6 address for the device.			
Preferred DNS Server	The first address used for DNS resolution.			
Alternate DNS Server	If the Preferred DNS server cannot be reached, the Alternate DNS Server is used.			
DHCPv6	If Enabled is selected, the DHCP server automatically assigns the IP configuration (IP address, subnet mask, and gateway IP address) and the values of those individual parameters (above) are not used. The setting of this DHCP state parameter is also viewable (read only), in the Network Interface tab of the Home page.			
Advanced LAN1 IP Configuration – Default alternate LAN1 IP address	Hardcoded default alternate IP address (169.254.1.1) that is available only when connected to the Ethernet port. When enabled, user can configure a second IP address for the bridge which is other than the hardcoded IP address (169.254.1.1).			
AUX Ethernet Port – AUX	Enabled: Data is enabled for Auxiliary port			
Ethernet Port				
AUX Ethernet	Enabled: PoE out is enable for Auxiliary port			
Ethernet Port PoE	Disabled: PoE out is disabled for Auxiliary port			
LAN2 Network Interface Configuration (Radio Private Interface) - IP Address	It is recommended not to change this parameter from the default AP/BHM private IP address of 192.168.101.1. A /24 CIDR subnet is used to communicate with each of the SMs/BHS that are registered. The AP/BHM uses a combination of the private IP and the LUID (logical unit ID) of the SM/BHS. It is only displayed for AP and BHM. Table 4: SM/BHS private IP and LUID			
	SM/BHS	LUID	Private IP	
	First SM/BHS registered	2	192.168.101.2	
	Second SM registered 3 192.168.101.3			

# **Auxiliary port**

An additional Ethernet port labeled **Aux** for Auxiliary port is implemented for downstream traffic. This feature is supported only for PTP/PMP 450i ODUs.

To enable the Aux port, follow these instructions:

#### Procedure 9 Enabling Aux port interface

1	Select menu option Configuration > IP > Aux Network Interface tab.:	
	Aux Notwork Interface	
	Aux Ethernet Port Port Pisabled	
	Aux Ethornal Port PoE Enabled	
2	Click Enable button of Aux Ethernet Port parameter to enable Aux Ethernet port	
3	Click Enable button of Aux Ethernet Port PoE parameter to enable Aux port PoE out.	
4	Click Save. "Reboot Required" message is displayed.	
5	Click Reboot.	

Table 5: Aux port attributes

Aux Network Interface		
Aux Ethernet Port	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	
Aux Ethernet Port PoE	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	

Attribute	Meaning	
Aux Ethernet Port	Enabled: Data is enabled for Auxiliary port Disabled: Data is disabled for Auxiliary port	
Aux Ethernet Port PoE	Enabled: PoE out is enable for Auxiliary port Disabled: PoE out is disabled for Auxiliary port	

By disabling this feature, the data at the Auxiliary port will be disabled.

# NAT, DHCP Server, DHCP Client and DMZ

Applicable	PMP:	þ SM
products		

The system provides NAT (Network Address Translation) for SMs in the following combinations of NAT and DHCP (Dynamic Host Configuration Protocol):

- NAT Disabled
- NAT with DHCP Client (DHCP selected as the Connection Type of the WAN interface) and DHCP Server
- NAT with DHCP Client(DHCP selected as the Connection Type of the WAN interface)
- NAT with DHCP Server
- NAT without DHCP

#### NAT

NAT isolates devices connected to the Ethernet or wired side of a SM from being seen directly from the wireless side of the SM. With NAT enabled, the SM has an IP address for transport traffic (separate from its address for management), terminates transport traffic and allows you to assign a range of IP addresses to devices that are connected to the Ethernet or wired side of the SM.

In the Cambium system, NAT supports many protocols, including HTTP, ICMP (Internet Control Message Protocols), and FTP (File Transfer Protocol). For virtual private network (VPN) implementation, L2TP over IPSec (Level 2 Tunneling Protocol over IP Security) and PPTP (Point to Point Tunneling Protocol) are supported.



### Note

When NAT is enabled, a reduction in throughput is introduced in the system (due to processing overhead).

### DHCP

DHCP enables a device to be assigned a new IP address and TCP/IP parameters, including a default gateway, whenever the device reboots. Thus, DHCP reduces configuration time, conserves IP addresses, and allows modules to be moved to a different network within the Cambium system.

In conjunction with the NAT features, each SM provides the following:

- A DHCP server that assigns IP addresses to computers connected to the SM by Ethernet protocol.
- A DHCP client that receives an IP address for the SM from a network DHCP server.

#### DMZ

In conjunction with the NAT features, a DMZ (Demilitarized Zone) allows the allotment of one IP address behind the SM for a device to logically exist outside the firewall and receive network traffic. The first three octets of this IP address must be identical to the first three octets of the NAT private IP address.

- A DHCP server that assigns IP addresses to computers connected to the SM by Ethernet protocol.
- A DHCP client that receives an IP address for the SM from a network DHCP server.

#### **NAT Disabled**

The NAT Disabled implementation is illustrated in below figure.

Figure 14: NAT disabled implementation



### **NAT with DHCP Client and DHCP Server**

The NAT with DHCP Client and DHCP server is illustrated in below figure.

Figure 15: NAT with DHCP client and DHCP server implementation



### **NAT with DHCP Client**

#### Figure 16: NAT with DHCP client implementation



### **NAT with DHCP Server**

#### Figure 17: NAT with DHCP server implementation



### **NAT without DHCP**

#### Figure 18: NAT without DHCP implementation



### **NAT and VPNs**

VPN technology provides the benefits of a private network during communication over a public network. One typical use of a VPN is to connect employees remotely (who are at home or in a different city), with their corporate network through a public Internet. Any of several VPN implementation schemes is possible. By design, NAT translates or changes addresses, and thus interferes with a VPN that is not specifically supported by a given NAT implementation.

With NAT enabled, SM supports L2TP over IPSec (Level 2 Tunneling Protocol over IP Security) VPNs and PPTP (Point to Point Tunneling Protocol) VPNs. With NAT disabled, SM supports all types of VPNs.

#### **IP interface with NAT disabled - SM**

The IP page of SM with NAT disabled is explained in below table.

Table 6: IP attributes - SM with NAT disabled

LAN1 Network Interface Configuration	
IP Address :	10.120.216.15
Network Accessibility :	Public     Docal
Subnet Mask :	255 255 255 0
Gateway IP Address :	10.120.216.254
DHCP state :	© Enabled Disabled
DHCP DNS IP Address :	Obtain Automatically     Oset Manually
Preferred DNS Server :	0.0.0
Alternate DNS Server :	0.0.0
Domain Name :	example.com

Attribute	Meaning		
IP Address	Enter the non-routable IP address to associate with the Ethernet connection on this SM. (The default IP address from the factory is 169.254.1.1.) If you forget this parameter, you must both:		
	physically access the module.		
	<ul> <li>use recovery mode to access the module configuration parameters at 169.254.1.1.</li> </ul>		
	Note		
Ŭ	Note or print the IP settings from this page. Ensure that you can readily associate these IP settings both with the module and with the other data that you store about the module.		
Network Accessibility	Specify whether the IP address of the SM must be visible to only a device connected to the SM by Ethernet (Local) or be visible to the AP/BHM as well (Public).		
Subnet Mask	Enter an appropriate subnet mask for the SM to communicate on the network. The default subnet mask is 255.255.0.0.		
Gateway IP Address	Enter the appropriate gateway for the SM to communicate with the network. The default gateway is 169.254.0.0.		
DHCP state	If you select Enabled, the DHCP server automatically assigns the IP configuration (IP address, subnet mask, and gateway IP address) and the values of those individual parameters (above) are not used. The setting of this DHCP state parameter is also viewable, but not settable, in the Network Interface tab of the Home page.		
	In this tab, DHCP State is settable only if the Network Accessibility parameter in the IF tab is set to Public. This parameter is also settable in the NAT tab of the Configuration web page, but only when NAT is enabled.		

Attribute	Meaning		
	If the DHCP state parameter is set to Enabled in the Configuration > IP sub-menu of the SM/BHS, do not check the BootpClient option for Packet Filter Types in its Protocol Filtering tab, because doing so can block the DHCP request. (Filters apply to all packets that leave the SM via its RF interface, including those that the SM itself generates.) If you want to keep DHCP enabled and avoid the blocking scenario, select the Bootp Server option instead. This will result in responses being appropriately filtered and discarded.		
DHCP DNS IP Address	Canopy devices allow for configuration of a preferred and alternate DNS server IP address either automatically or manually. Devices must set DNS server IP address manually when DHCP is disabled for the management interface of the device. DNS servers may be configured automatically from the DHCP response when DHCP is enabled for the management interface of the devices may be configured to set the DNS server IP address manually when DHCP is enabled for the management interface. The default DNS IP addresses are 0.0.0.0 when configured manually.		
Preferred DNS Server	The first DNS server used for DNS resolution.		
Alternate DNS Server	The second DNS server used for DNS resolution.		
Domain Name	The operator's management domain name may be configured for DNS. The domain name configuration can be used for configuration of the servers in the operator's network. The default domain name is example.com, and is only used if configured as such.		

### IP interface with NAT enabled - SM

The IP page of SM with NAT enabled is explained in below table.

Table 7: IP attributes - SM with NAT enabled

NAT Network Interface Configuration		
IP Address :	169.254.1.1	
Subnet Mask :	255.255.255.0	

Attribute	Meaning
IP Address	Assign an IP address for SM/BHS management through Ethernet access to the SM/BHS. Set only the first three bytes. The last byte is permanently set to 1. This address becomes the base for the range of DHCP-assigned addresses.
Subnet Mask	Assign a subnet mask of 255.255.255.0 or a more restrictive subnet mask. Set only the last byte of this subnet mask. Each of the first three bytes is permanently set to 255.

### NAT tab with NAT disabled - SM

The NAT tab of SM with NAT disabled is explained in below table.

#### Figure 19: NAT attributes - SM with NAT disabled

NAT Enume		
NAT Engola/Disable	III Enstaled # Disabled	
	Case Transport	
WAN Miniface		
Connection Typic	DECENTER.	
# Address	<b>特有</b> 非	
Submet Marsk	201.002.200.3	
Gateway IP Address	17 U 8-6	
Reply to Pregion VIAN Interface	<ul> <li>Enabled</li> <li>■ Disabled</li> </ul>	
LAN Infortace		
IP Address	No. COLUMN THE COLUMN	
Submet Mask	255 255 255 xxx	
DMZ Enable	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	
DM2 IP Address	ADM. REF. 4001.	
LAN DHCP Server		1
DHOP Server Enable/Disable	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	
EINOP Server Lease Timoout	Days (Range : 1 - 30)	
DHCP Start IP	KOX XXX XXX	
Number of IP's to Lease	for	
DNS Serwir Fraxy	Enabled Direction	_
DNS IP Address	Obtain Automatically (From WAN DHCP or PPPoE)     Sof Merically	
Preferred DNS IP Address	10 0 0 P	
Alternate DNS IP Address	a new second sec	

Remote Configuration Interface			
Remote Management Interlace :	Disable *		
Connection Type :	© DHCP @ Static IP		
IP Address :	0.0.0		
Subnet Mask :	255 255 255 0		
Geteway IP Address :	0.0.0		
Ottain Automatically     OHCP DNS IP Address :      Set Manually			
Preferred DNS Server :	0.0.0		
Atomate DNS Server :	0.0.0		
Domain Name :	example.com		

NAT Protocol Parameters		<u>a</u>
ARP Cache Timeout :	20	Minutes (Range : 1 — 30)
TCP Session Garbage Timeout :	120	Minutes (Range : 4 1440)
UDP Session Garbage Timeout :	4	Minutes (Range : 1 1440)
Translation Table Size :	2048	Translations (Range : 1024 - 8192)

Attribute	Meaning
NAT Enable/Disable	This parameter enables or disables the Network Address Translation (NAT) feature for the SM. NAT isolates devices connected to the Ethernet or wired side of a SM from being seen directly from the wireless side of the SM. With NAT enabled, the SM has an IP address for transport traffic separate from its address for management, terminates transport traffic, and allows you to assign a range of IP addresses to devices that are connected to the Ethernet or wired side of the SM.
	When NAT is enabled, VLANs are not supported on the wired side of that SM. You can enable NAT in SMs within a sector where VLAN is enabled in the AP/BHM, but this may constrain network design.
IP Address	This field displays the IP address for the SM. DHCP Server will not automatically assign this address when NAT is disabled.
Subnet Mask	This field displays the subnet mask for the SM. DHCP Server will not automatically assign this address when NAT is disabled.
Gateway IP Address	This field displays the gateway IP address for the SM. DHCP Server will not automatically assign this address when NAT is disabled.
ARP Cache Timeout	If a router upstream has an ARP cache of longer duration (as some use 30 minutes), enter a value of longer duration than the router ARP cache. The default value of this field is 20 minutes.
TCP Session Garbage Timeout	Where a large network exists behind the SM, you can set this parameter to lower than the default value of 120 minutes. This action makes additional resources available for greater traffic than the default value accommodates.
UDP Session Garbage Timeout	You may adjust this parameter in the range of 1 to 1440 minutes, based on network performance. The default value of this parameter is 4 minutes.
Translation Table Size	Total number of minutes that have elapsed since the last packet transfer between the connected device and the SM/BHS.



Note

When NAT is disabled, the following parameters are not required to be configurable:

WAN Interface > Connection Type, IP Address, Subnet Mask, Gateway IP address

LAN Interface > IP Address

LAN DHCP Server > DHCP Server Enable/Disable, DHCP Server Lease Timeout, Number of IP's to Lease, DNS Server Proxy, DNS IP Address, Preferred DNS IP address, Alternate DNS IP address

**Remote Management Interface > Remote Management Interface**, IP address, Subnet Mask, DHCP DNS IP Address, Preferred DNS Server, Alternate DNS Server, Domain Name

NAT Protocol Parameters > ARP Cache Timeout, TCP Session Garbage Timeout, UDP Session Garbage Timeout, Translation Table Size

### NAT tab with NAT enabled - SM

The NAT tab of SM with NAT enabled is explained in below table.

Figure 20: NAT attributes - SM with NAT enabled

NAT Enable	والمحاجب والمحاجب والمحاج والمحاج والتركي والمحاجر والتركي والمحاج	12
NAT Enable/Disable	Enabled     Disabled	
	(Save Charges)	
WAN Electace		
Connection Type :	DHCP 🔛	
P Address :	0203	
Subnet Mask	248.288.285.0	
Gatevray IP Address :	0.2.6.0	
Reply to Ping on WAN Interface :	C Enabled Disabled	
LAN Interface		12
P Address	189.254.3.5	
Subnet Nask	255 255 255 0	
DMZ Enable :	Chabled	
DMZ IP Address :	160 254 1 12	
LAN DHOP Server		12
DHCP Server Enable/Disable	Enabled	
DHCP Server Lease Timeout	30 Deys (Range : 1 - 30)	
DHCP Start IP :	169.254.1.2	
Number of Pis to Lease	50	
DNS Server Proxy ;	C Enabled	
Dris P Address	Obtain Automatically (From WAN DHCP or PPPoE) Set Manually	
Preferred DI/S IP Address	03.00	
Alternate CNS P Address	0.0.00	
The second		

Hermite Configuration Interface		
Remote Management Interface	Enable (Standarone Config)	
Connection Type :	C DHCP Static P	
IP Address :	108 254 1 2	
Subnet Hask	255 255 0 0	
Gateway P Address	169 254 0.0	
DHCP DNS IP Address :	Obtain Automatically Set Manually	
Preterred DNS Server	0.000	
Atternate DNS Server	0.000	
Domain Name :	acampia com	

NAT Protocol Parameters		
ARP Cache Timeout	20	Minutes (Range: 1 30)
TCP Session Garbage Timeout	120	Minutes (Range : 4 1440)
UDP Session Garbage Timeout :	4	Minutes (Range : 1 1440)

Attribute	Meaning
NAT Enable/Disable	See description in NAT tab with NAT disabled - SM.
WAN Interface	The WAN interface is the RF-side address for transport traffic.
Connection	This parameter may be set to
Гуре	Static IP—when this is the selection, all three parameters (IP Address, Subnet Mask, and Gateway IP Address) must be properly populated.
	DHCP—when this is the selection, the information from the DHCP server configures the interface.
	PPPoE—when this is the selection, the information from the PPPoE server configures the interface.
Subnet Mask	If Static IP is set as the Connection Type of the WAN interface, then this parameter configures the subnet mask of the SM for RF transport traffic.
Gateway IP Address	If Static IP is set as the Connection Type of the WAN interface, then this parameter configures the gateway IP address for the SM for RF transport traffic.
Reply to Ping on WAN Interface	By default, the radio interface does not respond to pings. If you use a management system (such as WM) that will occasionally ping the SM, set this parameter to Enabled.
LAN Interface	The LAN interface is both the management access through the Ethernet port and the Ethernet-side address for transport traffic. When NAT is enabled, this interface is redundantly shown as the NAT Network Interface Configuration on the IP tab of the Configuration web page in the SM.
IP Address	Assign an IP address for SM/BHS management through Ethernet access to the SM. This address becomes the base for the range of DHCP-assigned addresses.

Attribute	Meaning
Subnet Mask	Assign a subnet mask of 255.255.255.0 or a more restrictive subnet mask. Set only the last byte of this subnet mask. Each of the first three bytes is permanently set to 255.
DMZ Enable	Either enable or disable DMZ for this SM/BHS.
DMZ IP Address	If you enable DMZ in the parameter above, set the last byte of the DMZ host IP address to use for this SM when DMZ is enabled. Only one such address is allowed. The first three bytes are identical to those of the NAT private IP address. Ensure that the device that receives network traffic behind this SM is assigned this address. The system provides a warning if you enter an address within the range that DHCP can assign.
DHCP Server	This is the server (in the SM) that provides an IP address to the device connected to the Ethernet port of the SM.
DHCP Server Enable/Disable	Select either Enabled or Disabled. Enable to:
	<ul> <li>Allow this SM to assign IP addresses, subnet masks, and gateway IP addresses to attached devices.</li> <li>Assign a start address for DHCP.</li> <li>Designate how many IP addresses may be temporarily used (leased).</li> </ul>
	<ul> <li>Restrict SM/BHS from assigning addresses to attached devices.</li> </ul>
DHCP Server Lease Timeout	Based on network performance, enter the number of days between when the DHCP server assigns an IP address and when that address expires. The range of values for this parameter is 1 to 30 days. The default value is 30 days.
DHCP Start IP	If you enable DHCP Server below, set the last byte of the starting IP address that the DHCP server assigns. The first three bytes are identical to those of the NAT private IP address.
Number of IPs to Lease	Enter how many IP addresses the DHCP server is allowed to assign. The default value is 50 addresses.
DNS Server Proxy	This parameter enables or disables advertisement of the SM/BHS as the DNS server. On initial boot up of a SM with the NAT WAN interface configured as DHCP or PPPoE, the SM module will not have DNS information immediately. With DNS Server Proxy disabled, the clients will renew their lease about every minute until the SM has the DNS information to give out. At this point the SM will go to the full configured lease time period which is 30 days by default. With DNS Server Proxy enabled, the SM will give out full term leases with its NAT LAN IP as the DNS server.
DNS IP Address	Select either:
	Obtain Automatically to allow the system to set the IP address of the DNS server
	or

Attribute	Meaning	
	Set Manuall address.	y to enable yourself to set both a preferred and an alternate DNS IP
Preferred DNS IP Address	Enter the pr set to Set M	referred DNS IP address to use when the DNS IP Address parameter is Janually.
Alternate DNS IP Address	Enter the D Manually an	NS IP address to use when the DNS IP Address parameter is set to Set d no response is received from the preferred DNS IP address.
Remote Management Interface	To offer gre configured Managemer	eater flexibility in IP address management, the NAT-enabled SM's WAN Interface IP address may be used as the device Remote nt Interface (unless the SM's PPPoE client is set to Enabled)
	Disable: Wh address. Ma interface or	en this interface is set to "Disable", the SM is not directly accessible by IP magement access is only possible through either the LAN (Ethernet) a link from an AP web page into the WAN (RF-side) interface.
	Enable (Sta Config)", to information	ndalone Config): When this interface is set to "Enable (Standalone manage the SM/BHS the device must be accessed by the IP addressing provided in the Remote Configuration Interface section.
	2	Note When configuring PPPoE over the link, use this configuration option (PPPoE traffic is routed via the IP addressing specified in section Remote Configuration Interface).
	Enable (Use Interface)", SM is manag	e WAN Interface): When this interface is set to "Enable (Use WAN the Remote Configuration Interface information is greyed out, and the ged via the IP addressing specified in section WAN Interface).
	4	Note When using this configuration, the ports defined in section Configuration, Port Configuration are consumed by the device. For example, if FTP Port is configured as 21 by the SM, an FTP server situated below the SM must use a port other than 21. This also applies to DMZ devices; any ports specified in section Configuration, Port Configuration will not be translated through the NAT, they are consumed by the device's network stack for management.
Connection	This parame	eter can be set to:
Туре	Static IP: wh and Gatewa	nen this is the selection, all three parameters (IP Address, Subnet Mask, ay IP Address) must be properly populated.
	DHCP: when the interfac	n this is the selection, the information from the DHCP server configures e.
IP Address	If Static IP is configures t	s set as the Connection Type of the WAN interface, then this parameter the IP address of the SM for RF management traffic.
Subnet Mask	If Static IP is configures t	s set as the Connection Type of the WAN interface, then this parameter the subnet mask of the SM for RF management traffic.

Attribute	Meaning
Gateway IP Address	If Static IP is set as the Connection Type of the WAN interface, then this parameter configures the gateway IP address for the SM for RF management traffic.
	Note or print the IP settings from this page. Ensure that you can readily associate these IP settings both with the module and with the other data that you store about the module.
DHCP DNS IP	Select either:
Address	Obtain Automatically to allow the system to set the IP address of the DNS server.
	or
	Set Manually to enable yourself to set both a preferred and an alternate DNS IP address.
Preferred DNS Server	Enter the preferred DNS IP address to use when the DNS IP Address parameter is set to Set Manually.
Alternate DNS Server	Enter the DNS IP address to use when the DNS IP Address parameter is set to Set Manually and no response is received from the preferred DNS IP address.
Domain Name	Domain Name to use for management DNS configuration. This domain name may be concatenated to DNS names used configured for the remote configuration interface.
ARP Cache Timeout	If a router upstream has an ARP cache of longer duration (as some use 30 minutes), enter a value of longer duration than the router ARP cache. The default value of this field is 20 (minutes).
TCP Session Garbage Timeout	Where a large network exists behind the SM, you can set this parameter to lower than the default value of 120 (minutes). This action makes additional resources available for greater traffic than the default value accommodates.
UDP Session Garbage Timeout	You may adjust this parameter in the range of 1 to 1440 minutes, based on network performance. The default value of this parameter is 4 (minutes).

### **NAT DNS Considerations - SM**

SM DNS behavior is different depending on the accessibility of the SM. When NAT is enabled the DNS configuration that is discussed in this document is tied to the RF Remote Configuration Interface, which must be enabled to utilize DNS Client functionality. Note that the WAN DNS settings when NAT is enabled are unchanged with the addition of the management DNS feature discussed in this document.

NAT Configuration	Management Interface Accessibility	DHCP Status	DNS Status
NAT Enabled	RF Remote Management Interface Disabled	N/A	DNS Disabled
	RF Remote Management Interface Enabled	DHCP Disabled	DNS Static Configuration
		DHCP Enabled	DNS from DHCP or DNS Static Configuration

Table 8: SM DNS Options with NAT Enabled

### **NAT Port Forwarding tab – SM**

NAT Port Forwarding allows customers to define an external port as well as an internal port, which could be the same or different. The limitation of 10 entries also has been removed. If there are any NAT Port Forwarding rules that have mismatching internal and external ports, they will be removed upon downgrade to any release before 16.1.1 and these rules will be lost. Any NAT Port Forwarding rules with matching internal and external ports will be preserved upon downgrading to releases prior to 16.1.1 as well as imported upon upgrading from releases older than 16.1.1.

After upgrading to 16.1.1, NAT Port Mapping rules will be automatically applied to NAT Port Forwarding with same external and internal port mapping.

The NAT Port Forwarding tab of the SM is explained in below table.

Table 9: NAT Port Forwarding attributes - SM

Port Forwarding Config	uration	
Internal IP :		
Internal Port :	0	(0-65535)
External Port :	0	(0-65535)
Protocol :	AJ: P	Yatocola 🧧
	Add/M	odity Remove

	Internal IP	Internal Port	External Port	Protocol
10	0.110.215.78	80	8080	ALL
10	0.110.215.80	443	443	ALL

Attribute	Meaning
Internal IP	Enter Internal IP address to access the port.
Internal Port	Enter Internal Port to access the port.
External Port	Enter External Port to access the port.
Protocol	Select protocol for traffic through the port.

#### DHCP - BHS

Applicable	PTP:	þ	BHM
ducts			
-			

DHCP enables a device to be assigned a new IP address and TCP/IP parameters, including a default gateway, whenever the device reboots. Thus, DHCP reduces configuration time, conserves IP addresses, and allows modules to be moved to a different network within the Cambium system.

In conjunction with the NAT features, each BHS provides:

- A DHCP server that assigns IP addresses to computers connected to the BHS by Ethernet protocol.
- A DHCP client that receives an IP address for the BHS from a network DHCP server.

## **Reconnecting to the management PC**

If the IP Address, Subnet Mask and Gateway IP Address of the unit have been updated to meet network requirements, then reconfigure the local management PC to use an IP address that is valid for the network. See Configuring the management PC

Once the unit reboots, log in using the new IP address. See Logging into the web interface

# **VLAN configuration for PMP**

Applicable	PMP:	þ	AP	þ	SM
products					

### **VLAN Remarking**

VLAN Remarking feature allows the user to change the VLAN ID and priority of both upstream and downstream packets at the Ethernet Interface. The remarking configuration is available for:

1. VLAN ID re-marking

Note

2. 802.1p priority re-marking

For Q-in-Q VLAN tagged frame, re-marking is performed on the outer tag.

#### **VLAN ID Remarking**

SM supports the ability to re-mark the VLAN ID on both upstream and downstream VLAN frames at the Ethernet interface. For instance, a configuration can be added to re-mark VLAN ID 'x' to VLAN ID 'y' as shown in below table. AP does not support VLAN ID remarking.

Table 10: VLAN Remarking Example

VLAN frame direction	Remarking
Upstream	SM receives VLAN ID 'x' frame at the Ethernet interface, checks the configuration and re-marks to VLAN ID 'y'. So VLAN ID 'y' frame comes out of AP's Ethernet interface. When SM re-marks, a dynamic entry in VLAN membership table for 'y' is added to allow reception of VLAN ID 'y' downstream packet.
Downstream	AP receives VLAN ID 'y' frame at the Ethernet interface and sends to SM. SM accepts the frame as it has an entry in the membership table and re-marks to VLAN ID 'x'. This reverse re- marking is necessary because the downstream devices do not know of re- marking and are expecting VLAN 'x' frames. This remarking is done just before sending the packet out on Ethernet interface.
### 802.1P Remarking

AP/BHM and SM/BHS allow re-marking of 802.1p priority bits for the frames received at the Ethernet interface. Priority bits are not re-marked for the packets sent out of Ethernet interface (reverse direction).

Configuration must be added at SM/BHS for upstream frames and at AP/BHM for downstream frames.

### **VLAN Priority Bits configuration**

VLAN Priority Bits Configuration feature allows the user to configure the three 802.1p bits upon assigning VLAN to an ingress packet. The priority bits configuration is available for:

- Default Port VID
- Provider VIDs
- MAC Address mapped Port VID
- Management VID

#### Default Port VID

This VID is used for untagged frames and will correspond to the Q-Tag for 802.1Q frames (if VLAN Port Type is Q), or the C-Tag for 802.1ad frames (if the VLAN Port Type is QinQ).

The priority bits used in the Q-tag/C-tag are configurable.

The configuration can be:

- Promote IPv4/IPv6 priority The priority in the IP header is copied to the Q-tag/C-tag.
- Define priority Specify the priority in the range of 0 to 7. This value is used as priority in the Q-tag/C-tag.

#### MAC Address Mapped VID

If a packet arrives at the SM/BHS that is sourced from a device whose MAC address is in the table, then the corresponding VID is used for that frame's Q-tag (Q port) or C-tag (QinQ port). The priority bits used in the Q-tag/C-tag are configurable similar to default port VID.

#### Provider VID

The provider VID is used for the S-tag. The priority bits used in the S-tag are configurable similar to default port VID. Provider VID has an extra priority configuration:

Copy inner tag 802.1p priority - The priority in the C-tag is copied to the S-tag.

#### Management VID

This VID is used to communicate with AP/BHM and SM/BHS for management purposes. The priority bits used in the Q-tag are configurable similar to default port VID.

Use AP's Management VID for ICC connected SM

This feature allows the SM to use the AP's management VLAN ID when the SM is registered to the AP via ICC. This feature is useful for the customer who uses a different management VID for the SM and AP and Zero Touch feature is enabled for configuration. This parameter may be accessed via the Configuration > VLAN page on the AP's web management interface.

# VLAN page of AP

The VLAN tab of the AP/BHM is explained in below table.

Figure 21: AP/BHM VLAN tab attributes

VLAN Configuration		
VLAN:	Enabled     Disabled	
Always use Local VLAN Config :	Enat Disal (NOTE) option t	bled bled If you want to run spectrum analysis on this AP, enable this o keep VLAN settings intact when booting as an SM.)
Allow Frame Types :	All Frames *	
Dynamic Learning :	Enabled     Disabled	
VLAN Aging Timeout :	25 Minutes (Range: 5 - 1440 Minutes)	
Management VID (Range : 1-4094) :	U	
QinQ EtherType :	0×88a8	*
Use AP's Management VID for ICC connected SM :	© Enat • Disa	bled

# Active Configuration

VLAN Not Active

VLAN Membership Configuration			
VLAN Membership Table Configuration :	1	(Range : 1 - 4094)	
Contraction and a second s	Add Member	Remove Member	

VLAN Membership Tal	ble			
Empty Set		_		
VLAN 802.1p Remarki	ng			8
Source VLAN		(R	ange : 1 — 4094)	
Remark Priority :	0	(R	ange : 0 — 7)	
	Add/Modify 802.1p Rema	arking	Remove 802.1p Remarking	

VLAN Remarking Table	1
Empty Set	

Attribute	Meaning			
VLAN	Specify whether VLAN functionality for the AP and all linked SMs must (Enabled) or may not (Disabled) be allowed. The default value is Disabled.			
Always use Local VLAN Config	Enable this option before you reboot this AP as a SM to use it to perform spectrum analysis. Once the spectrum analysis completes, disable this option before you reboot the module as an AP.			
Allow Frame Types	Select the type of arriving frames that the AP must tag, using the VID that is stored in the Untagged Ingress VID parameter. The default value is All Frames.			
Dynamic Learning	Specify whether the AP must (Enabled) or not (Disabled) add the VLAN IDs (VIDs) of upstream frames to the VID table. (The AP passes frames with VIDs that are stored in the table both upstream and downstream.). The default value is Enabled.			
VLAN Aging Timeout	Specify how long the AP must keep dynamically learned VIDs. The range of values is 5 to 1440 (minutes). The default value is 25 (minutes).			
	Note           VIDs that you enter for the Management VID and VLAN Membership parameters do not time out.			
Management VID	Enter the VID that the operator wishes to use to communicate with the module manager. The range of values is 1 to 4095. The default value is 1.			
Default Port VID	Any untagged frames at AP's Ethernet ingress are tagged with the default port VID.			
QinQ EtherType	Modules can be configured with 802.1ad Q-in-Q DVLAN (Double-VLAN) tagging which is a way for an operator to put an 802.1Q VLAN inside of an 802.1ad VLAN. A nested VLAN, which is the original 802.1Q tag and a new second 802.1ad tag, allows for bridging of VLAN traffic across a network and segregates the broadcast domains of 802.1Q VLANs. Q-in-Q can be used with PPPoE and/or NAT. The 802.1ad standard defines the S-VLAN as the Service Provider VLAN and the C- VLAN as the customer VLAN. The radio software does 2 layer Q-in-Q whereby the C- VLAN is the 802.1Q tag and the S-VLAN is the second layer Q tag as shown below: Q-in-Q Ethernet frame			
	EthernetS-VLAN EthTypeC-VLAN EthTypeIP Data EthTypeHeader0x88a80x81000x0800			
	The 802.1ad S-VLAN is the outer VLAN that is configurable on the Configuration > VLAN web page of the AP. The Q-in-Q EtherType parameter is configured with a default EtherType of 0x88a8 in addition to four alternate EtherTypes that can be configured to aid in interoperability with existing networks that use a different EtherType than the default.			

Attribute	Meaning
	The C-VLAN is the inner VLAN tag, which is the same as 802.1Q. As a top-level concept, this operates on the outermost tag at any given time, either "pushing" a tag on or "popping" a tag off. This means packets will at most transition from an 802.1Q frame to an 801.ad frame (with a tag "pushed" on) or an untagged 802.1 frame (with the tag "popped" off. Similarly, for an 802.1ad frame, this can only transition from an 802.1ad frame to an 802.1Q frame (with the tag "popped" off. Similarly, for an 802.1ad frame, this can only transition from an 802.1ad frame to an 802.1Q frame (with the tag "popped" off) since the radio software only supports 2 levels of tags.
Use AP's Management VID for ICC connected SM	This field allows the SM to use the AP's management VLAN ID when the SM is registered to the AP via ICC.
VLAN Not Active	When VLAN is enabled in the AP, the Active Configuration block provides the following details as read-only information in this tab. In the Cambium fixed wireless broadband IP network, each device of any type is automatically a permanent member of VID 1. This facilitates deployment of devices that have VLAN enabled with those that do not.
VLAN Membership Table Configuration	For each VLAN in which you want the AP to be a member, enter the VLAN ID and then click the Add Member button. Similarly, for any VLAN in which you want the AP to no longer be a member, enter the VLAN ID and then click the Remove Member button.
VLAN Membership table	This field lists the VLANs that an AP is a member of. As the user adds a number between 1 and 4094, this number is populated here.
Source VLAN (Range: 1- 4094)	Enter the VID for which the operator wishes to remark the 802.1p priority for the downstream packets. The range of values is 1 to 4094. The default value is 1.
Remark Priority (Range 0-7)	This is the priority you can assign to the VLAN Tagged packet. Priority of O is the highest.
VLAN Remarking table	As the user enters a VLAN and a Remarking priority, this information is added in this table.

# VLAN page of SM

The VLAN tab of SM/BHS is explained in below table.

### Table 11: SM VLAN attributes

VLAN Configuration					
VLAN Port Type :	Q 1	Q			
Accept QinQ Frames	* Ena	Enabled * Disabled			
Allow Frame Types	AD Prat		1 :		
Dynamic Learning	* Ena	bied			
VLAN Aging Timeout :	28	Minutes (Ra	nge 5-1	440 Minutes)	
Management VID (Range : 1 - 4094)	1	Priority #	(0-7)	Promote #V-41P-6 pr	karity 🔻
SM Management VID Pass-through	© Dis © Ena (NOTE interfa based	able ible E If disabled, MY ce Also, if Mana ), then this settin	/ID traffic wi igement VIE ig vill be ign	If not be allowed to ) is the same as a lored and assume	o or from the SM wired Port VID (Default or MAC- d to be Enabled )
Default Port VID (Range: 1 - 4094)	1	Priority #	(0-7)	Promote (Pv4/iPv6.pr	HARTY 🔻
Port VID MAC Address Mapping MAC address of 0's indicates an unused entry VID Range: 1 — 4094 Priority Range: 0 — 7	00-00-00-00-00-00 00-00-00-00-00-00 00-00-00-00-00-00 00-00-00-00-00-00 00-00-00-00 00-00 00-00-00 00-00 00-00-00 00-00-00 00-00-00 00-00-00 00-00-00 00-00-00 00-00-00 00-00-00 00-00-00 00-00-00 00-00-00 00-00-00 00-00-00 00-00-00 00-00-00 00-00 00-00-00 00-00 00-00-00 00-00		VID 1 VID 1	Priority 8 Priority 8 Priority 8 Priority 8 Priority 9 Priority 9 Priority 9 Priority 9 Priority 9 Priority 9 Priority 9	Prantite Pv4.Pv4 priority * Prantite Pv4.Pv4 priority *
Provider VID (Range   1 - 4054) :	1	Priority #	(0-7)	Promote (Po4/0P/d pr	wetter •
Support 802.1p Frames (VID 0)	6 Ena # Disa	abled			

Active Configuration	
Default Port VID 1 MAC Address VID Map Management VID 1 SM Management VID Passthrough Enabled Dynamic Ageing Timeout 25 Allow Learning Yes Allow Frame Type All Frame Types QinQ Disabled QinQ EthType 0x88a8 Allow QinQ Tagged Frames No	
Current VID Member Set. VID Number Type Age	
1 Permanent 0	3
1 Peribanent D	
Active Configuration	
VLAN Not Active	

VLAN Membership Configuration		
VLAN Membership Table Configuration	1 Add Mr	(Range ; 1 — 4094) miler   Remove Member
VLAN Membership Table:		
VLAN VID Remarking		
Source VLAN		(Range 1-4094)
Remark to VLAN	1	(Range 1-4094)
	Ant Modify VID R	emarking Ramove VID Remarking

Attribute	Meaning			
VLAN Port Type	By default, this is Q, indicating that it is to operate in the existing manner. The other option is Q-in-Q, which indicates that it must be adding and removing the S-Tag, and adding a C-Tag if necessary for untagged packets. The VLAN Port type corresponds to the Ethernet port of the SM/BHS. Currently, the internal management interfaces will always operate as Q ports.			
Accept QinQ Frames	This option existing 80: will come ir egress the E will show up	This option is valid for the Q-in-Q port so that the user may force blocking of existing 802.1ad Q-in-Q frames. This way, only untagged or single tagged packets will come in and out of the Ethernet interface. If a Q-in-Q frame is about ingress or egress the Ethernet interface and this is disabled, it is dropped and a filter entry will show up on the VLAN Statistics page as DVLAN Egress or DVLAN Ingress.		
Allow Frame Types	Select the t stored in th	ype of arriving frames that the SM must tag, using the VID that is e Untagged Ingress VID parameter. The default value is All Frames.		
	Tagged Fra	mes Only: The SM only tags incoming VLAN-tagged frames		
	Untagged F	rames Only: The SM will only tag incoming untagged frames		
Dynamic Learning	Specify who frames (tha The default	Specify whether the SM must (Enable) or not (Disable) add the VIDs of upstream frames (that enter the SM through the wired Ethernet interface) to the VID table. The default value is Enable.		
VLAN Aging Timeout	Specify hov values is 5 t	v long the SM/BHS must keep dynamically learned VIDs. The range of o 1440 (minutes). The default value is 25 (minutes).		
	2	Note VIDs that you enter for the Untagged Ingress VID and Management VID parameters do not time out.		
Management VID	Enter the V is 1 to 4095	ID that the SM/BHS must share with the AP/BHM. The range of values . The default value is 1.		
SM Management VID Pass-through	Specify whether to allow the SM/BHS (Enabled) or the AP/RADIUS (Disabled) to control the VLAN settings of this SM. The default value is Enabled.			
	When VLAN is enabled in the AP to whom this SM is registered, the Active Configuration block provides the following details as read-only information in this tab. In the Cambium fixed wireless broadband IP network, each device of any type is automatically a permanent member of VID 1. This facilitates deployment of devices that have VLAN enabled with those that do not.			
	If disabled, MVID traffic is not allowed to or from the SM wired interface. Also, if Management VID is the same as a Port VID (Default or MAC-based), then this setting is ignored and assumed to be Enabled.			
Default Port VID	This is the VID that is used for untagged frames and will correspond to the Q-Tag for 802.1Q frames (if VLAN Port Type is Q), or the C-Tag for 802.1ad frames (if the VLAN Port Type is Q-in-Q).			

Attribute	Meaning
Port VID MAC Address Mapping	These parameters allow operators to place specific devices onto different VLANs (802.1Q tag or 802.1ad C-tag) based on the source MAC address of the packet. If the MAC address entry is 00-00-00-00-00 then that entry is not used. If a packet arrives at the SM that is sourced from a device whose MAC address is in the table, then the corresponding VID is used for that frame's Q-tag (Q port) or C-tag (Q-in-Q port). If there is no match, then the Default Port VID is used. This table is also used in the downstream direction for removal of the tag based on the destination MAC address so that an untagged (for Q port) or Q-Tagged (for Q-in-Q port) frame is delivered to the end device. You may use wildcards for the non-OUI (Organizationally Unique Identifier) portion of the MAC address, which is the last 3 bytes. MAC addresses contain 6 bytes, the first 3 of which are the OUI of the vendor that manufactured the device and the last 3 are unique to that vendor OUI. If you want to cover all devices from a known vendor's OUI, you have to specify 0xFF for the remaining 3 bytes. So, for example, if you wanted all devices from a specific vendor with an OUI of 00-95-5b (which is a Netgear OUI) to be on the same VID of 800, you have to specify an entry with MAC address 00-95-5b-ff-ff-ff. Then, any device underneath of the SM with MAC addresses starting with 00-95-5b is put on VLAN 800.
Provider VID	The provider VID is used for the S-tag. It is only used if the Port Type is Q-in-Q and will always be used for the S-tag. If an existing 802.1Q frame arrives, the Provider VID is what is used for adding and removing of the outer S-tag. If an untagged frame arrives to a Q-in-Q port, then the Provider VID is the S-tag and the Default Port VID (or Port VID MAC Address Mapping, if valid) is used for the C-tag.
Support 802.1p Frames	This parameter allows the operator to enable or disable 802.1p frames. When 802.1p feature is enabled on SM, the packets are added with VID=0 and priority bits are set.
Active Configuration, Default Port VID	This is the value of the parameter of the same name, configured above.
Active Configuration, MAC Address VID Map	This is the listing of the MAC address VIDs configured in Port VID MAC Address Mapping.
Active Configuration, Management VID	This is the value of the parameter of the same name, configured above.
Active Configuration, SM Management VID Pass-Through	This is the value of the parameter of the same name, configured above.
Active Configuration, Dynamic Aging Timeout	This is the value of the VLAN Aging Timeout parameter configured above.

Attribute	Meaning			
Active Configuration, Allow Learning	Yes is displayed if the value of the Dynamic Learning parameter above is Enabled. No is displayed if the value of Dynamic Learning is Disabled.			
Active Configuration, Allow Frame Type	This displays the selection that was made from the drop-down list at the Allow Frame Types parameter above.			
Active Configuration, QinQ	This is set to Enabled if VLAN Port Type is set to QinQ, and is set to Disabled if VLAN Port Type is set to Q.			
Active Configuration, QinQ EthType	This is the value of the QinQ EtherType configured in the AP.			
Active Configuration, Allow QinQ Tagged Frames	This is the value of Accept QinQ Frames, configured above.			
Active Configuration, Current VID Member Set, VID Number	This column lists the ID numbers of the VLANs in which this module is a member, whether through assignment or through dynamic learning.			
Active Configuration,	For each VID number in the first column, the entry in this column correlates the way in which the module became and continues to be a member:			
Member Set, Type	Permanent—This indicates that the module was assigned the VID number through direct configuration by the operator.			
	Dynamic—This indicates that the module adopted the VID number through enabled dynamic learning, when a tagged packet from a SM behind it in the network or from a customer equipment that is behind the SM in this case, was read.			
Active Configuration,	For each VID number in the first column of the table, the entry in this column reflects whether or when the VID number will time out:			
Current VID Member Set, Age	Permanent type - Number never times out and this is indicated by the digit 0.			
	Dynamic type - Age reflects what is configured in the VLAN Aging Timeout parameter in the Configuration => VLAN tab of the AP or reflects a fewer number of minutes that represents the difference between what was configured and what has elapsed since the VID was learned. Each minute, the Age decreases by one until, at zero, the AP deletes the learned VID, but can it again from packets sent by elements that are beneath it in the network.			
	Note Values in this Active Configuration block can differ from attempted values in configurations:			

Attribute	Meaning			
	The AP can override the value that the SM has configured for SM Management VID Pass-Through.			
IP Lookup Direction	<ul> <li>This parameter supports following options.</li> <li>Use Source IP: Mapping is done based on the source IP of the incoming packet.</li> <li>Use Destination IP: Mapping is done based on the Destination IP of the incoming packet.</li> </ul>			
IP Address / Subnet Mask	This parameter specifies the IP Address and the Subnet Mask which needs to be matched.			
VID	This parameter specifies the VLAN which is tagged to the packet.			
Priority Mode	This parameter specifies the priority precedence to decide if 802.1p or DSCP Priority bits need to be used when making priority decisions.			
Priority	This parameter specifies the 802.1p Priority bits in the VLAN tag.			
L3 Port VID Map	This field displays the Map key, IP address/subnet mask, VID, Priority mode, Priority, and Hash key information of the tagged packets.			

# **VLAN Membership tab of SM**

The **Configuration > VLAN > VLAN Membership** tab is explained in below table.

Table 12: SM VLAN Membership attributes

VLAN Membership Configuration	E
VLAN Membership Table Configuration : 10 (Range : 1 — 4094)	
Add Member Remove Member	
VLAN Membership Table	
VLAN Membership Table VID Number Type Age	
10 Static	

Attribute	Meaning
VLAN	For each VLAN in which you want the AP to be a member, enter the VLAN ID and
Membership	then click the Add Member button. Similarly, for any VLAN in which you want the AP
Table	to no longer be a member, enter the VLAN ID and then click the Remove Member
Configuration	button.

# **VLAN configuration for PTP**

Applicable	PTP:	þ	BHM	þ	BMS
products					

# VLAN page of BHM

The VLAN tab of BHS is explained in below table.

Table 13: BHM VLAN page attributes

VLAN Configuration	
VLAN :	Enabled     Disabled
VLAN Port Type :	Q •
Accept QinQ Frames :	© Enabled
Management VID (Range : 1 - 4094) :	1 Priority (0 - 7) Promote IPv4/IPv6 priority •
Default Port VID (Range : 1 - 4094) :	1 Priority (0 – 7) Promote IPv41Pv6 priority •
QinQ EtherType :	0x88a8 •

### Active Configuration

Default Port VID	: 1 Priority : Pr	omote IPv4/IPv6 priority
Management VID	):1 Priority:F	Promote IPv4/IPv6 priority
QinQ Disabled		
QinQ EthType : 0	x88a8	
Allow QinQ Tagg	ed Frames : No	
Current VID Men	iber Set:	
VID Number	Type	Age
1	Permanent	0

Attribute	Meaning
VLAN	Specify whether VLAN functionality for the BHM and all linked BHS must be (Enabled) or may not (Disabled) be allowed. The default value is Disabled.
VLAN Port Type	By default, this is Q, indicating that it is to operate in the existing manner. The other option is Q-in-Q, which indicates that it must be adding and removing the S-Tag, and adding a C-Tag if necessary for untagged packets. The VLAN Port type corresponds to the Ethernet port of the BHS. Currently, the internal management interfaces will always operate as Q ports.
Accept QinQ Frames	This option is valid for the Q-in-Q port so that the user may force blocking of existing 802.1ad Q-in-Q frames. This way, only untagged or single tagged packets will come in and out of the Ethernet interface. If a Q-in-Q frame is about ingress or egress the Ethernet interface and this is disabled, it is dropped and a filter entry will show up on the VLAN Statistics page as DVLAN Egress or DVLAN Ingress.
Management VID (Range 1- 4094)	Enter the VID that the BHS must share with the BHM. The range of values is 1 to 4095. The default value is 1.
Default Port VID (Range 1- 4094)	This is the VID that is used for untagged frames and corresponds to the Q-Tag for 802.1Q frames (if VLAN Port Type is Q), or the C-Tag for 802.1ad frames (if the VLAN Port Type is Q-in- Q).
QinQ Ether Type	Modules can be configured with 802.1ad Q-in-Q DVLAN (Double-VLAN) tagging which is a way for an operator to put an 802.1Q VLAN inside of an 802.1ad VLAN. A nested VLAN, which is the original 802.1Q tag and a new second 802.1ad tag, allows for bridging of VLAN traffic across a network and segregates the broadcast domains of 802.1Q VLANs. Q-in-Q can be used with PPPoE and/or NAT.

Attribute	Meaning			
	The 802.1ad standard defines the S-VLAN as the Service Provider VLAN and the C- VLAN as the customer VLAN. The radio software does 2-layer Q-in-Q whereby the C- VLAN is the 802.1Q tag and the S-VLAN is the second layer Q tag as shown below:			
	Ethernet Header	C-VLAN EthType 0x8100	IP Data EthType 0x0800	
	The 802.1ad S-VLAN is the outer VLAN that is configurable on the Configuration > VLAN web page of the BHM. The Q-in-Q EtherType parameter is configured with a default EtherType of 0x88a8 in addition to four alternate EtherTypes that can be configured to aid in interoperability with existing networks that use a different EtherType than the default.			
	The C-VLAN is t concept, this op on or "popping" frame to an 801. the tag "popped 802.1ad frame to only supports 2	the inner VLAN tag, which erates on the outermos a tag off. This means part ad frame (with a tag "pu d" off. Similarly, for an 80 o an 802.1Q frame (with levels of tags.	ch is the same as 802.1Q t tag at any given time, o ackets will at most trans ushed" on) or an untagg 02.1ad frame, this can or the tag "popped" off) s	As a top-level either "pushing" a tag ition from an 802.1Q ed 802.1 frame (with aly transition from an ince the radio software
VLAN Not Active	When VLAN is e following details broadband IP ne of VID 1. This fac that do not.	enabled in the BHM, the s as read-only informatio etwork, each device of a silitates deployment of c	Active Configuration blo on in this tab. In the Cam any type is automatically devices that have VLAN	ock provides the hbium fixed wireless a permanent member enabled with those

# VLAN page of BHS

### The VLAN tab of BHS is explained in below table.

Table 14: BHS VLAN page attributes

VLAN Configuration				<b>=</b>
VLAN :	© Ena ® Disc	ibled abled		
VLAN Port Type :	Q :	-		
Accept QinQ Frames :	<ul> <li>Ena</li> <li>Disc</li> </ul>	ibled abled		
Management VID (Range : 1 - 4094) :	1	Priority 0	(0 - 7) Promote IPv4/IPv6 priority .	
Default Port VID (Range : 1 - 4094) :	1	Priority 0	(0 - 7) Promote IPv4/IPv6 priority .	
Default Port VID (Range : 1 - 4094) :	1	Priority 0	(0 — 7) Promote IPv4/IPv6 priority 🔳	

VLAN Not Active

Attribute	Meaning
VLAN	Specify whether VLAN functionality for the BHM and all linked BHS must be (Enabled) or may not (Disabled) be allowed. The default value is Disabled.

Attribute	Meaning
VLAN Port Type	By default, this is Q, indicating that it is to operate in the existing manner. The other option is Q-in-Q, which indicates that it must be adding and removing the S-Tag, and adding a C-Tag if necessary for untagged packets. The VLAN Port type corresponds to the Ethernet port of the BHS. Currently, the internal management interfaces will always operate as Q ports.
Accept QinQ Frames	This option is valid for the Q-in-Q port so that the user may force blocking of existing 802.1ad Q-in-Q frames. This way, only untagged or single tagged packets will come in and out of the Ethernet interface. If a Q-in-Q frame is about ingress or egress the Ethernet interface and this is disabled, it is dropped and a filter entry will show up on the VLAN Statistics page as DVLAN Egress or DVLAN Ingress.
Management VID (Range 1- 4094)	Enter the VID that the BHS must share with the BHM. The range of values is 1 to 4095. The default value is 1.
Default Port VID (Range 1- 4094)	This is the VID that is used for untagged frames and corresponds to the Q-Tag for 802.1Q frames (if VLAN Port Type is Q), or the C-Tag for 802.1ad frames (if the VLAN Port Type is Q-in- Q).
VLAN Not Active	When VLAN is enabled in the BHM, the Active Configuration block provides the following details as read-only information in this tab. In the Cambium fixed wireless broadband IP network, each device of any type is automatically a permanent member of VID 1. This facilitates deployment of devices that have VLAN enabled with those that do not.

# PPPoE page of SM

Point-to-Point Protocol over Ethernet (PPPoE) is a protocol that encapsulates PPP frames inside Ethernet frames (at Ethernet speeds). Benefits to the network operator may include

- Access control
- Service monitoring
- Generation of statistics about activities of the customer
- Re-use of infrastructure and operational practices by operators who already use PPP for other networks

PPPoE options are configurable for the SM only, and the AP indicates whether or not PPPoE is enabled for a specific subscriber.

When PPPoE is enabled, once the RF session comes up between the SM and the AP, the SM will immediately attempt to connect to the PPPoE Server. You can monitor the status of this by viewing the PPPoE Session Log in the Logs section (Administrator only). Every time the RF session comes up, the SM will check the status of the link and if it is down, the SM will attempt to redial the link if necessary depending on the Timer Type. Also, on the Configuration page, the user may 'Connect' or 'Disconnect'

the session manually. This can be used to override the session to force a manual disconnect and/or reconnect if there is a problem with the session.

In order to enable PPPoE, NAT MUST be enabled on the SM and Translation Bridging MUST be disabled on the AP. These items are strictly enforced for you when you are trying to enable PPPoE. A message will indicate any prerequisites not being met. Also, the NAT Public IP DHCP client cannot be enabled, because the NAT Public IP is received through the IPCP process of the PPPoE discovery stages.

The pre-requisites are:

- NAT MUST be enabled on the SM:
- NAT DHCP Client is disabled automatically. The NAT public IP is received from the PPPoE Server.
- NAT Public Network Interface Configuration will not be used and must be left to defaults. Also NAT Public IP DHCP is disabled if it is enabled.

Translation Bridging MUST be DISABLED on the AP

• This will only be determined if the SM is in session since the SM won't know the AP configuration otherwise. If the SM is not in session, PPPoE can be enabled but if the SM goes into session to a Translation Bridge-enabled AP, then PPPoE will not be enabled.

The PPPoE configuration parameters are explained in below table.

### Table 15: SM PPPoE attributes

PPPoE Configuration	A A STATE						
PPPoE :	Enabled C Disabled NAT DHCP Client will be disabled.						
Access Concentrator:							
Service Name :							
Authentication Type:	None •						
User Name :	tearmin						
Password							
MTU:	Use MTU Received from PPPoE Server     Ouse User Defined MTU						
Timer Type :	Keep Alive						
Timer Period :	30 seconds (20s Minimum)						
TCP MSS Clamping :	<ul> <li>C Enabled</li> <li>I Disabled</li> </ul>						

Attribute	Meaning
Access Concentrator	An optional entry to set a specific access concentrator to connect to for the PPPoE session. If this is blank, the SM will accept the first access concentrator which matches the service name (if specified). This is limited to 32 characters.
Service Name	An optional entry to set a specific service name to connect to for the PPPoE session. If this is left blank the SM will accept the first service option that comes back from the access concentrator specified above, if any. This is limited to 32 characters.
Authentication	None means that no PPPoE authentication is implemented
Туре	CHAP/PAP means that CHAP authentication is attempted first, then PAP authentication. The same password is used for both types.
User Name	This is the CHAP/PAP user name that is used if CHAP/PAP authentication is selected. If None is selected for authentication, then this field is unused. This is limited to 32 characters.
Password	This is the CHAP/PAP password that is used if PAP authentication is selected. If None is selected for authentication, then this field is unused. This is limited to 32 characters.
MTU	Use MTU Received from PPPoE Server causes the SM to use the MRU of the PPPoE server received in LCP as the MTU for the PPPoE link.

Attribute	Meaning
	Use User Defined MTU allows the operator to specify an MTU value to use to override any MTU that may be determined in the LCP phase of PPPoE session setup. If this is selected, the user is able to enter an MTU value up to 1492. However, if the MTU determined in LCP negotiations is less than this user-specified value, the SM will use the smaller value as its MTU for the PPPoE link.
Timer Type	Keep Alive is the default timer type. This timer will enable a keepalive that will check the status of the link periodically. The user can set a keepalive period. If no data is seen from the PPPoE server for that period, the link is taken down and a reconnection attempt is started. For marginal links, the keep alive timer can be useful so that the session will stay alive over periodic dropouts. The keepalive timer must be set such that the session can outlast any session drop. Some PPPoE servers will have a session check timer of their own so that the timeouts of the server and the SM are in sync, to ensure one side does not drop the session prematurely.
	Idle Timeout enables an idle timer that checks the usage of the link from the customer side. If there is no data seen from the customer for the idle timeout period, the PPPoE session is dropped. Once data starts flowing from the customer again, the session is started up again. This timer is useful for users who may not be using the connection frequently. If the session is idle for long periods of time, this timer will allow the resources used by the session to be returned to the server. Once the connection is used again by the customer, the link is reestablished automatically.
Timer Period	The length in seconds of the PPPoE keepalive timer.
TCP MSS Clamping	If this is enabled, then the SM will alter TCP SYN and SYN-ACK packets by changing the Maximum Segment Size to be compatible with the current MTU of the PPPoE link. This way, the user does not have to worry about MTU on the client side for TCP packets. The MSS is set to the current MTU – 40 (20 bytes for IP headers and 20 bytes for TCP headers). This will cause the application on the client side to not send any TCP packets larger than the MTU. If the network is exhibiting large packet loss, try enabling this option. This may not be an option on the PPPoE server itself. The SM will NOT reassemble IP fragments, so if the MTUs are incorrect on the end stations, then MSS clamping will solve the problem for TCP connections.

# IPv4 and IPv6

Applicable products	PMP:	$\mathbf{\nabla}$	AP		SM	PTP:	BHM		BMS
- debuterers by ensures			70254	1.12.2.2	12010	4.44.4	 1.11.11.11.11	1.1.2.2.2.1	1000

### **IPv4 and IPv6 Prioritization**

450 Platform Family provides operators the ability to prioritize IPv6 traffic in addition to IPv4 traffic. IPv6/IPv4 prioritization can be configured by selecting a CodePoint and the corresponding priority from the GUI of the AP/BHM and the IPv6/IPv4 packet is set up accordingly. There is no GUI option for selecting IPv6 or IPv4 priority. Once the priority is set, it is set for IPv4 and IPv6 packets.

### Configuring IPv4 and IPv6 Priority

IPv4 and IPv6 prioritization is set using the **DiffServ** tab on the AP/BHM and SM/BHS (located at **Configuration > DiffServ**). A priority set to a specific CodePoint will apply to both IPv4 and IPv6 traffic.

Table 16: DiffServ attributes - AP/BHM

Diffiery Contoundors							
CodePoints (00) (07):	IDA STOCK	Designed the			1. (24.24.24.411)	dica-to.	
CP00 0 CP01 1	CP02 1	CP03:1	CP04 1	CP05 1	CP05 1	CP67 1	
CodePoints (08) - (15):	The second	1.20				Topic - A-	
CP08_1_CP09_1	CP18:1	CP11 1	CP12 1	OP13 1	CP14 T	CP15:1	
CodePoints (16) - (23):	CD10.2	inner a	-	mona a	pana a	0000 14	
CodeBoints (14) (31)	Ch.18 5	Ch.18.1	Q*24 2	UP2111	UP22 2	0728.1	
CP24 3 CP25 1	CP26:3	CP27.1	CP28 3	CP29-1	CP30 3	CP31: 1	
CodePoints (32) - (39):							
CP32 4 CP33 1	CP34:4	CP35:1	CP38:4	GP37:1	CP38.4	CP39:1	
GodePoints (40) (47):	CD42 4	(D45 +	10044	PR. 12 - 1	more e	CB4T +	
CodePoints (48) - (85)	SPENE 1	100.43	0.0099-04	20030-14	01.49.5	State 1	
CP48:0 CP48:1	CP50 1	CP51:1	OP52 1	OP53 1	CP54 1	OP55 1	
CodePoints (56) - (63):							
CP56:7 CP57:1	CP58 1	CP59:1	CP60 1	GP61 1	CP62:1	GP831	
GodePoint Select				1.0			
Priarity Select				1.4			
Priority Precedence :				Diffigury That	302.3g.♥ )		
PPPoE Control Message	Proofity			Critigh			
	100100		_	a paracition			
DSCP Steam Provity Se	thors						
				(DEashled)			
Prioritize DSCP Streams				· Delabled			
AND AND AND AND				# Upstream			
USUP Stream Hole				Downstre	ATTN:		
DSCP Stream Identifier :				0 (0-6	3)		
OSCP Stream Priority				Lon 🖌	1		
OSCP Stream Priority Des	scription ;						
	[ A00	Mudty DSCP	Stream Prior	ly   Hermone I	SCP Sheart P	Printly   Disar DISOP Stream Priorities	
<b>BSCP Stream Prioritizatio</b>	n: Disabled		frank and	and has a second second			
Role Upstream	0002022						
CT C	_	_	_	_	_		
WHIS Consponsion			_	_			
MPCB TRATIC Class (TC) 0	1		-	1 V			
MPLS Traffic Class (TC) 1				14			
MPLS TRINC Glass (TC) 2	1			14			
MIPES TRATE Class (TC) 2	-			34			
MPLB TRINC GUSS (TC) #	9			19			
MPLS Hatte Class (TG) 5	G			04			
MPLS Halls Gass (TC) (	1						
the second							

Attribute	Meaning							
Codepoints 1 through 63	The PMP family of APs support four levels or priority values to data channels is determine configured per SM as shown in the table bel	f QoS. Th ed by the ow:	e mappin number o	ig of thes of data ch	e eight nannels			
	Number of QoS levels →	1	2	3	4			
	Level 1	0-7	0-3	0-1	0-1			
	Level 2		4-7	2-3	2-3			
	Level 3	-	-	4-7	4-5			
	Level 4		-	-	6-7			

Attribute	Meaning
	For example, for an AP that uses the default table shown above has configured 3 QoS levels per SM, would see codepoints 0 through 15 mapped to the Low Priority data channels, codepoint 16 would be mapped to the Medium Priority data channels, and so on.
	Note that CodePoints 0, 8, 16, 24, 32, 48, and 56 are predefined to the fixed values shown in IPv4 and IPv6 Prioritization above and are not user configurable. Operator cannot change any of these three fixed priority values. Among the configurable parameters, the priority values (and therefore the handling of packets in the high or low priority channel) are set in the AP/BHM for all downlinks within the sector and in the SM/BHS for each uplink.
CodePoint Select	This represents the CodePoint Selection to be modified via Priority Select.
Priority Select	The priority setting input for the CodePoint selected in CodePoint Select.
Priority Precedence	Allows operator to decide if 802.1p or DiffServ priority bits must be used first when making priority decisions.
PPPoE Control Message Priority	Operators may configure the AP/BHM to utilize the high priority channel for PPPoE control messages. Configuring the AP/BHM in this fashion can benefit the continuity of PPPoE connections when there are issues with PPPoE sessions being dropped in the network. This prioritization may be configured in the DiffServ tab in the Configuration menu of the AP/BHM.
Prioritize DSCP Streams	Provision to Enable/Disable the feature for this SM's link.
DSCP Stream Role	
DSCP Stream Identifier	
DSCP Stream Priority	
DSCP Stream Priority Description	
MPLS Traffic Class (TC) 0 through	The Multi-Protocol Label Switching (MPLS) protocol is used to route traffic based on the priority setting configured each MPLS Traffic Class.
MPLS Traffic Class (TC) 7	MPLS Traffic Class (TC) 0 through MPLS Traffic Class (TC) 7 can be configured with 0 through 7 priority settings.

### **IPv4 and IPv6 Filtering**

The operator can filter (block) specified IPv6 protocols including IPv4 and ports from leaving the AP/BHM and SM/BHS and entering the network. This protects the network from both intended and inadvertent packet loading or probing by network users. By keeping the specified protocols or ports off the network, this feature also provides a level of protection to users from each other.

### **Configuring IPv4 and IPv6 Filtering**

IPv6 filters are set using the Protocol Filtering tab on the AP/BHM and SM/BHS (at Configuration > Protocol Filtering). Once a filter is set for a packet type, those packets will not be sent over the RF interface depending on "Filter Direction" setting.

Table 17: Packet Filter Configuration attributes

Packet Filter Configuration		
Packet Filter Types :	PPPoE     All IPv4     SMB (Network Neighborhood)     SNMP     Bootp Client     Bootp Server     IPv4 Multicast     User Defined Port 1 (See Below)     User Defined Port 2 (See Below)     User Defined Port 3 (See Below)     User Defined Port 3 (See Below)     All other IPv4     All IPv6     SMB (Network Neighborhood)     SNMP     Bootp Client     Bootp Server     IPv6 Multicast     All other IPv6     All other IPv6     All other IPv6     All other IPv6     All other IPv6	
Filter Direction :	✓ Upstream ✓ Downstream	

Dest #1	1 Provident Makers	
Port #1	p (Decimal Value)	
TCP :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	
UDP :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	
Port #2 :	p (Decimal Value)	
TCP :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	
UDP :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	
Port #3 :	p (Decimal Value)	
TCP	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	
UDP :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	

AP Specialty Filters		
RF Telnet Access	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	
PPPoE PADI Downlink Forwarding :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	

Attribute	Meaning
Packet Filter Types	For any box selected, the Protocol and Port Filtering feature blocks the associated protocol type.
	To filter packets in any of the user-defined ports, you must do all of the following:
	<ul> <li>Check the box for User Defined Port n (See Below) in the Packet Filter Types section of this tab.</li> </ul>
	<ul> <li>Provide a port number at Port #n. in the User Defined Port Filtering Configuration section of this tab</li> </ul>
	<ul> <li>Enable TCP and/or UDP by clicking the associated radio button</li> </ul>
Filter Direction	Operators may choose to filter upstream (uplink) RF packets or downstream (downlink) RF packets.
User Defined Port Filtering Configuration	You can specify ports for which to block subscriber access, regardless of whether NAT is enabled.

# Upgrading the software version and using CNUT

This section consists of the following procedures:

- Upgrading to a new software version
- Checking the installed software version



### Caution

If the link is operational, ensure that the remote end of the link is upgraded first using the wireless connection, and then the local end can be upgraded. Otherwise, the remote end may not be accessible.

Use CNUT 4.11.2 or later version and always refer to the software release notes before upgrading system software. The release notes are available at:

https://support.cambiumnetworks.com/files/pmp450

https://support.cambiumnetworks.com/files/ptp450

# Checking the installed software version

To check the installed software version, follow these instructions:

Procedure 10 Checking the installed software version:

- 1. Click on General tab under Home menu.
- 2. Note the installed Software Version (under Device Information):

PMP/PTP 450/450i/450m

Software Version: CANOPY 15.0.1 AP-None

3. Go to the support website (see Contacting Cambium Networks) and find Point-to-Multipoint software updates. Check that the latest 450 Platform Family software version is the same as the

installed Software Version.

4. To upgrade software to the latest version, see Upgrading to a new software version

# Upgrading to a new software version

All 450 platform modules are upgraded using the Canopy Network Updater Tool. The Canopy Network Updater Tool (CNUT) manages and automates the software upgrade process for a Canopy radio, or CMM4 (but not its 14-port switch) across the network. This eliminates the need for an administrator to visit each radio in the network (or each AP/BHM while using the Auto update feature) to upgrade the modules.



### Note

Please ensure that you have the most up-to-date version of CNUT by browsing to the Customer Support Web Page located: https://www.cambiumnetworks.com/products/software-tools/cambiumnetwork-updater-tool/

This section includes an example of updating a single unit before deployment. System-wide upgrading procedures may be found in the CNUT Online Help manual, which can be found on the Cambium support website (see Contacting Cambium Networks).

### **CNUT functions**

The Canopy Network Updater tool has the following functions:

- Automatically discovers all network elements
- Executes a UDP command that initiates and terminates the Auto-update mode within APs/BHMs. This command is both secure and convenient:
  - For security, the AP/BHM accepts this command from only the IP address that you specify in the Configuration page of the AP/BHM.
  - For convenience, Network Updater automatically sets this Configuration parameter in the APs/BHMs to the IP address of the Network Updater server when the server performs any of the update commands.
- CNUT supports HTTP and HTTPS
- Allows you to choose the following among updating:
  - Your entire network.
  - Only elements that you select.
  - Only network branches that you select.
- Provides a Script Engine that you can use with any script that:
  - You define.
  - Cambium supplies.
- Configurability of any of the following to be the file server for image files:

- The AP/BHM, for traditional file serving via UDP commands and monitoring via UDP messaging
- CNUT HTTP/HTTPS Server, for upgrading via SNMP commands and monitoring via SNMP messaging. This also supports an option to either set the image order specifically for this file server or to allow the AP to determine the order.
- Local TFTP Server, for traditional file serving via UDP commands and monitoring via UDP messaging. This supports setting the number of simultaneous image transfers per AP/BHM
- The capability to launch a test of connectivity and operational status of the local HTTP, HTTPS and TFTP file servers
- An interface that supports efficient specification of the proper IP address for the local file server(s) where Network Updater resides on a multi-homed computer
- An md5 checksum calculator utility for identifying corruption of downloaded image files before Network Updater is set to apply them.

### Network element groups

With the Canopy Network Updater Tool, you can identify element groups composed of network elements that you select. Identifying these element groups does the following:

- Organizes the display of elements (for example, by region or by AP/BHM cluster).
- Allows to:
  - Perform an operation on all elements in the group simultaneously.
  - Set group-level defaults for ftp password access and SNMP Community String (defaults that can be overridden in an individual element when necessary).

### **Network layers**

A typical network contains multiple layers of elements, with each layer farther from the Point of Presence. For example, SMs (or BHS) are behind an AP/BHM and thus, in this context, at a lower layer than the AP/BHM. Correctly portraying these layers in Network Updater is essential so that Network Updater can perform radio and AP/BHM cluster upgrades in an appropriate order.

### Script engine

Script Engine is the capability in Network Updater that executes any user-defined script against any network element or element group. This capability is useful for network management, especially for scripts that you repetitively execute across your network.

The Autodiscovery capability in Network Updater finds all of your network elements. This comprehensive discovery:

- Ensures that, when you intend to execute a script against all elements, the script is indeed executed against all elements.
- Maintains master lists of elements (element groups) against which you selectively execute scripts.

The following scripts are included with CNUT:

- Gather Customer Support Information
- Set Access Point Authentication Mode
- Set Autoupdate Address on APs/BHMs
- Set SNMP Accessibility
- Reset Unit

### Software dependencies for CNUT

CNUT functionality requires:

- one of the following operating systems:
  - Windows® 2000
  - Windows Server 2003
  - Windows 7 and Windows 8
  - Windows XP or XP Professional
  - Red Hat Enterprise Linux (32-bit) Version 4 or 5
- Java<sup>™</sup> Runtime Version 2.0 or later (installed by the CNUT installation tool)

### **CNUT download**

CNUT can be downloaded together with each system release that supports CNUT. Software for these system releases is available from <a href="https://www.cambiumnetworks.com/products/software-tool/cambium-network-updater-tool/">https://www.cambiumnetworks.com/products/software-tool/</a> tools/cambium-network-updater-tool/, as either:

- A .zip file for use without the CNUT application.
- A .pkg file that the CNUT application can open.

### Upgrading a module prior to deployment

To upgrade to a new software version, follow this:

#### Procedure 11 Upgrading a module prior to deployment

- 1. Go to the support website (see Contacting Cambium Networks) and find Point-to-Multipoint software updates. Download and save the required software image.
- 2. Start CNUT
- 3. If you don't start up with a blank new network file in CNUT, then open a new network file with the New Network Archive operation (located at File >New Network).
- 4. Enter a new network element to the empty network tree using the Add Elements to Network Root operation (located at Edit >Add Elements to Network Root).

- 5. In the Add Elements dialogue, select a type of Access Point or Subscriber Module and enter the IP address of 169.254.1.1.
- 6. Make sure that the proper Installation Package is active with the Package Manager dialogue (located at Update > Manage Packages).
- 7. To verify connectivity with the radio, perform a Refresh, Discover Entire Network operation (located at View >Refresh/Discover Entire Network). You must see the details columns for the new element filled in with ESN and software version information.
- 8. Initiate the upgrade of the radio using Update Entire Network Root operation (located at Update >Update Entire Network Root). When this operation finishes, the radio is done being upgraded.

# **General configuration**

The **Configuration > General page** of the AP/BMH or BHM/BHS contains many of the configurable parameters that define how the ratios operate in sector or backhaul.

Applicable products	PMP:	☑	AP		SM	PTP:		BHM		BMS
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# PMP 450m and PMP/PTP 450i Series

General page - PMP 450i AP

The General page of AP is explained in below table.

### Table 18: General page attributes - PMP/PTP 450i AP

Link Speeds		E.	
Link Speed :	Auto 1000F/100F	100H/10F/10H *	
Ethernet Link :	* Enabled		
Ethernet Bounce Timeout :	Disabled     Minut	tes (Range : 0-60 Minutes, 0 = Disable)	
(Dec.			
802.3at Type 2 PoE Status :	Not Present (Ig	nored)	
PoE Classification :	© Enabled		
	* Disabled		
Bandwidth Configuration Source		E.	
Configuration Source :	SM	7	
Sync Setting		E .	
Sync input :	Generate Sync	*	
Free Run Before GPS Sync :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>		
Region Settings			
Region :	Other - Regulator		
Country :	Other •		
Wash Dana Configuration			
Webpage Auto Update :	Seconds	s (0 = Disable Auto Update)	
Dridas Cardiauralias			
Bridge Entry Timeout :	25 Minut	es (Range : 25-1440 Minutes)	
chage chay through the	© Enabled	as (range : 22 - rero meanes)	
Translation Bridging :	* Disabled		
Send Untranslated ARP :	Enabled	© Enabled	
SM isolation	Disabled		
Constant University Desired Desired	Enabled - If destination address is not known, forward packet to all SMs.		
Forward Unknown Unicast Packets .	Disabled - If	destination address is not known, drop packet.	
Update Application Information			
Update Application Address :	0.0.0.0		
TCP Settings		E)	
Prioritize TCP ACK :	Enabled		
Layer 2 Discovery Destination Address	C Provident	8	
Multicast Destination Address :	<ul> <li>Broadcast</li> <li>ELDP Multic</li> </ul>	ast	
DMCD Dolay Acoust			
DHCP Relay Agent :	Disable		
	Append DNS	5 Domain Name	
DHCP Server (Name or IP Address) :	* Disable DNS	Domain Name	
Online 22 Cline # ID -	200.200.200.200 \$apmacb1\$		
option az circuit ib .			
Option 82 Remote ID :	\$immacb1\$		
Option 82 Vendor Specific ID :	\$smvidbi\$		
Coordinates			
Latitude :	+0.000000	Decimal Degree	
Longitude :	+0.000000	Decimal Degree	
Height :	0	Meters	
SM Reconnection			
Report SM Reconnection Failure After Channel/FIRP Channel	Enable		
Failure Reporting Threshold for SM Reconnection	Disable		
Failure Report Duration :	7 Days (R	ange : 1 — 30)	

Attribute	Meaning
Link Speed	From the drop-down list of options, select the type of link speed for the Ethernet connection. The Auto settings allow the two ends of the link to automatically negotiate with each other the best possible speed, and check whether the Ethernet traffic is full duplex or half duplex.
	However, some Ethernet links work best when either:
	<ul> <li>both ends are set to the same forced selection</li> <li>both ends are set to auto-negotiate and both have capability in least one common speed and traffic type combination.</li> </ul>
Ethernet Link	This parameter allows the operator to enable or disable Ethernet Link.
Ethernet Bounce Timeout	This parameter allows the operator to configure Ethernet bounce timeout ranging from 0 to 60 minutes. Value 0 disables Ethernet bounce timeout.
802.3at Type 2 PoE Status and	When the PoE Classification functionality is enabled and if Type 2 power is not present, the PAs do not power up and draw too much power.
PoE Classification	By default, the PoE Classification feature is disabled and the PAs will power up regardless of the classification presented by the power source.
(PMP 450i Series only)	This is supported only on 450i series devices.
	PoE Classification configuration status also can be check under <b>Home &gt; General &gt;</b> Device Information tab:
	802.3at Type 2 PoE Status : Not Present (Ignored)
Configuration Source	See Setting the Configuration Source
Sync Input	See Configuring synchronization
Free Run Before GPS Sync	See Free Run Before GPS Sync
Region	From the drop-down list, select the region in which the radio is operating.
Country	From the drop-down list, select the country in which the radio is operating.
	Unlike selections in other parameters, your Country selection requires a Save Changes and a Reboot cycle before it will force the context-sensitive GUI to display related options (for example, Alternate Frequency Carrier 1 and 2 in the Configuration > Radio tab).
	PMP 450i Series ODUs shipped to the United States is locked to a Region Code setting of "United States". Units shipped to regions other than the United States must be configured with the corresponding Region Code to comply with local regulatory requirements. Country Code settings affect the radios in the following ways:
	Maximum transmit power limiting (based on radio transmitter power plus

Attribute	Meaning			
	configured antenna gain) • DFS operation is enabled based on the configured region code, if applicable			
	For more information on how transmit power limiting and DFS is implemented for each country, see the PMP 450 Planning Guide.			
Webpage Auto Update	Enter the frequency (in seconds) for the web browser to automatically refresh the web-based interface. The default setting is 0. The 0 setting causes the web-based interface to never be automatically refreshed.			
Bridge Entry Timeout	Specify the appropriate bridge timeout for correct network operation with the existing network infrastructure. The Bridge Entry Timeout must be a longer period than the ARP (Address Resolution Protocol) cache timeout of the router that feeds the network.			
	Caution An inappropriately low Bridge Entry Timeout setting may lead to temporary loss of communication with some end users.			
Translation Bridging	Optionally, you can configure the AP to change the source MAC address in every packet it receives from its SMs to the MAC address of the SM that bridged the packet, before forwarding the packet toward the public network. If you do, then:			
	Not more than 128 IP devices at any time are valid to send data to the AP from behind the SM.			
	SM populates the Translation Table tab of its Statistics web page, displaying the MAC address and IP address of all the valid connected devices.			
	Each entry in the Translation Table is associated with the number of minutes that have elapsed since the last packet transfer between the connected device and the SM.			
	If 128 are connected and another attempts to connect:			
	If no Translation Table entry is older than 255 minutes, the attempt is ignored.			
	If an entry is older than 255 minutes, the oldest entry is removed and the attempt is successful.			
	The Send Untranslated ARP parameter in the General tab of the Configuration page can be:			
	Disabled, so that the AP overwrites the MAC address in Address Resolution Protocol (ARP) packets before forwarding them.			
	Enabled, so that the AP forwards ARP packets regardless of whether it has overwritten the MAC address.			
	When this feature is disabled, the setting of the Send Untranslated ARP parameter has no effect, because all packets are forwarded untranslated (with the source MAC address intact).			

Attribute	Meaning
Send Untranslated	If the Translation Bridging parameter is set to Enabled, then the Send Untranslated ARP parameter can be:
ARP	Disabled - so that the AP will overwrite the MAC address in Address Resolution Protocol (ARP) packets before forwarding them.
	Enabled - so that the AP will forward ARP packets regardless of whether it has overwritten the MAC address.
	If the Translation Bridging parameter is set to Disabled, then the Send Untranslated ARP parameter has no effect.
SM Isolation	Prevent or allow SM-to-SM communication by selecting from the following drop- down menu items:
	Disable SM Isolation (the default selection). This allows full communication between SMs.
	Block SM Packets from being forwarded - This prevents both multicast/broadcast and unicast SM-to-SM communication.
	Block and Forward SM Packets to Backbone - This not only prevents multicast/broadcast and unicast SM-to-SM communication but also sends the packets, which otherwise are handled SM to SM, through the Ethernet port of the AP.
Forward Unknown Unicast Packets	Enabled: All unknown Unicast packets (no entry in the AP's bridge table) received via the AP's Ethernet LAN interface are forwarded to registered SMs. If the target device is situated beneath a particular SM, when the device responds the SM and AP will learn and add the device to their bridge tables so that subsequent packets to that device is bridged to the proper SM.
	Disabled: All unknown Unicast packets (no entry in the AP's bridge table) received via the AP's Ethernet LAN interface are discarded at the AP.
Update Application Address	Enter the address of the server to access for software updates on this AP and registered SMs.
Prioritize TCP ACK	To reduce the likelihood of TCP acknowledgement packets being dropped, set this parameter to Enabled. This can improve throughput that the end user perceives during transient periods of congestion on the link that is carrying acknowledgements. This parameter, when enabled, can be particularly useful when running bi-direction FTP sessions over the link. If a link is primarily used for video surveillance, it is recommended to set this parameter to Disable.
Multicast Destination Address	Using Link Layer Discovery Protocol (LLDP), a module exchanges multicast addresses with the device to which it is wired on the Ethernet interface. Although some switches (CMM4, for example) do not pass LLDP addresses upward in the network, a radio can pass it as the value of the Multicast Destination Address parameter value in the connected device that has it populated.
DHCP Relay Agent	The AP may act as a DHCP relay for SMs and CPEs underneath it. The AP will make use of the DHCP Option 82 (DHCP Relay Agent Information) from RFC 3046 when performing relay functions. The AP offers two types of DHCP relay functionality:

Attribute	Meaning
	Full Relay Information - Configuring the DHCP Full Relay Operation will take broadcast DHCP packets and send them to a Unicast server in unicast mode. This way the DHCP requests and replies can be routed like any other UDP packet.
	Only Insert Option 82 - This option leaves the DHCP request on its broadcast domain as opposed to DHCP Full Relay Operation which will turn it into a unicast packet.
	In order to accommodate setting up pools or classes for different VLANs, the Option 82 field will include information to tell the server what VLAN the client is on.
DHCP Server (Name or IP Address)	The DHCP relay server may be either a DNS name or a static IP address in dotted decimal notation. Additionally, the management DNS domain name may be toggled such that the name of the DHCP relay server only needs to be specified and the DNS domain name is automatically appended to that name. The default DHCP relay server addresses are 255.255.255.255 with the appending of the DNS domain name disabled.
Option 82 Circuit ID	This parameter specifies the Circuit ID for DHCP Relay Option 82 data. Following wildcards are supported:
	<ul> <li>\$apmac\$ - AP MAC adddress in ascii format, no delimiters</li> </ul>
	• \$apmacbi\$ - AP MAC address in hex format (6 bytes)
	• \$smmac\$ - SM MAC adddress in ascii format, no delimiters
	• \$smmacbi\$ - SM MAC address in hex format (6 bytes)
	<ul> <li>\$apsn\$ - AP Site Name (may be truncated to 32 chars)</li> </ul>
	• \$smsn\$ - SM Site Name (may be truncated to 32 chars)
	• \$smvid\$ - SM Port VID in ascii format, leading 0 included, 4 chars long
	• \$smvidbi\$ - SM Port VID in hex format (2 bytes)
	• \$smluid\$ - SM LUID
	Default value is \$apmacbi\$
	Note: Overall expanded Option 82 data is limited to 255 bytes.
Option 82 Remote ID	This parameter specifies the Remote ID for DHCP Relay Option 82 data. Following wildcards are supported:
	<ul> <li>\$apmac\$ - AP MAC adddress in ascii format, no delimiters</li> </ul>
	<ul> <li>\$apmacbi\$ - AP MAC address in hex format (6 bytes)</li> </ul>
	<ul> <li>\$smmac\$ - SM MAC adddress in ascii format, no delimiters</li> </ul>
	• \$smmacbi\$ - SM MAC address in hex format (6 bytes)
	<ul> <li>\$apsn\$ - AP Site Name (may be truncated to 32 chars)</li> </ul>
	• \$smsn\$ - SM Site Name (may be truncated to 32 chars)

Attribute	Meaning				
	• \$smvid\$ - SM Port VID in ascii format, leading 0 included, 4 chars long				
	• \$smvidbi\$ - SM Port VID in hex format (2 bytes)				
	• \$smluid\$ - SM LUID				
	Default value is \$smmacbi\$				
	Note: Overall expanded Option 82 data is limited to 255 bytes.				
Option 82	This parameter specifies the Vendor Specific ID for DHCP Relay Option 82 data.				
Specific ID	Following wildcards are supported:				
	<ul> <li>\$apmac\$ - AP MAC adddress in ascii format, no delimiters</li> </ul>				
	• \$apmacbi\$ - AP MAC address in hex format (6 bytes)				
	• \$smmac\$ - SM MAC adddress in ascii format, no delimiters				
	• \$smmacbi\$ - SM MAC address in hex format (6 bytes)				
	• \$apsn\$ - AP Site Name (may be truncated to 32 chars)				
	• \$smsn\$ - SM Site Name (may be truncated to 32 chars)				
	• \$smvid\$ - SM Port VID in ascii format, leading 0 included, 4 chars long				
	• \$smvidbi\$ - SM Port VID in hex format (2 bytes)				
	• \$smluid\$ - SM LUID				
	Default value is \$smvidbi\$				
	<b>Note</b> : Overall expanded Option 82 data is limited to 255 bytes.				
Latitude	Physical radio location data may be configured via the Latitude, Longitude and				
Longitude	is calculated in Meters.				
Height					
Report SM Reconnection Failure After Channel/EIRP Change	Provision to enable/disable flag for this feature.				
Failure Reporting Threshold for SM Reconnection	If the percentage of the number of SMs which failed to reconnect after EIRP/channel change exceeds this value, a failure will be reported via an alarm and a warning banner.				
Failure Report Duration	The number of days the AP will print the warning banner and allow the cnMaestro alarm to be displayed, before clearing them both, in the of absence enough SMs reconnecting to bring the reconnect failure percentage below the failure threshold.				

# General page - PMP 450m AP

The General page of AP is explained in below table.

Figure 22: General page attributes -PMP 450m AP

Trui Fastures		
MAMO	CErabled	
and the second se	Challoud	
Viterfininine Carvallation	Obstitud	
Children and Chi		
Distanted Post Valenting	Stat Turt -	
Lies figerd	And 1000 YOM YOR TON TON -	
SPP Link Speed	and there are a	
Effected Line :	* Enabled	
Advances that any Property	Disabled	
Energy Books sheets	b means while a new second a chevral	
Bandwidth Configuration Source		
Contrauration Dourine	40 · · ·	
Core Sectors		
Tight Input :	Gameran Ayas . +	
Fina Hue Betwe OPS from	Enabled	
	/ Diabled	
Dana Settina		
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Update Apphilipon Aditmete	3440	
TCP Settings		
Prioritius TCP ACE 1	* Ensteal	
in the second se	C Disabled	
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Midnest Desthictory Address	CBrowthast	
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VLAM lagging of LLDP Pockets :	Putter VLAN W/D Cartiguration     Calesian United and	
	C Analy Control of	
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	in the second	
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NAMES OF TAXABLE PARTY AND ADDRESS OF TAXABLE PARTY.	Erative	
report and mechanisms restore After chamele ere Change	O Dividito	
Pailure Reporting Treachold for SM Reconnection		
Failure Report Duration	F Days (Harge: 1 - 30)	

Attribute	Meaning	
MU-MIMO	This parameter allows to enable or disable Trial mode for radios with a Limited key for MU-MIMO operation. Once the trial key is applied, the 30-day trial can be enabled or disabled at any time.	
Interference Cancellation	When an operator upgrades a 5 GHz 450m to Release 22.2, a free 30-day trial of the uplink interference cancellation software is included. By default, this trial mode is disabled. When an operator enables the trial mode, the 30-day timer starts.	
	Note that the 30-day trial can be enabled or disabled at any time. The amount of time left on this trial or the MU-MIMO trial can be viewed on the <b>HOME</b> -> <b>General Status</b> page of the AP. Also, enabling this trial by itself is not sufficient to activate the UL Interference Cancellation feature. It must also be enabled via SNMP or the <b>Configuration</b> -> <b>Radio</b> page on the AP.	
Ethernet Port Selection	Ethernet Port selection is applicable to the 450m platform only with two choices in the drop-down list:	
	• Main: A selection of main indicates that link connectivity and power to the 450m is provided through the RF45 connection on the Main port of the AP	
	<ul> <li>SFP: A selection of SFP indicates that link connectivity will be provided through the SFP port on the 450m</li> </ul>	
	Power continues to be provided via the RJ45 Main port (5 GHz 450m only; the 3 GHz 450m utilizes a separate DC connector).	
For information about remaining attributes, refer PMP 450m and PMP/PTP 450i Series.		

# General page - PMP 450i SM

The General page of PMP 450i SM is explained in below table. The General page of PMP 450 SM looks the same as PMP 450i SM.

Table 19: General page attributes - PMP 450i SM

Link Sponts			
Link Speed	Auto 10007/1007/10040107/10H +		
Emernet Link	Enabled     Disabled     Bounce Mais Ethernal Part		
Ethernel flounce Timeout	Minutes (Range 0-60 Monutes, 0 = Disable)		
PUE		-	
602 Sat Type 2 PoE Status	Not Present (ignored)		
PoE Classification	Enabled     Disabled		
Sync Setting		=	
Renote Device Type	© PMP:PTP 100 # Other		
Augion Settings	and a second	2	
Region	Other - Regulatory +		
Country	Ober •		
Wob Page Configuration		=	
Webpage Auto Update	B Seconds (0 = Disable Auto Updale)		

bridge Configuration	
Endge Entry Timeout	25 Minutes (Range: 25-++1440 Minutes)
Endge Table Size :	40% (Rango 4-40%) (Note 2 entries in the bridge table are used for internal purpose)
Bindge Table Restriction	Drop packets if MAC address is not in bridge table # Forward packets even if MAC address is not in bridge table

Frame Tenang			
Frame Timing Pulse Galad	<ul> <li>Enable (if SM out of sync then do not propagate the frame limiting pulse)</li> <li>Disable (Always propagate the frame timing pulse)</li> </ul>		
Layer 2 Discovery Destination Address			
Multicest Destination Address	10 Broadcast + LLDP Multicast		

Coordinates			1
Latitude	-8-000000	Decimal Degree	
Longitude	+0.00000	Decimal Degree	
Height		Meters	

Attribute	Meaning		
Link Speed	From the drop-down list of options, select the type of link speed for the Ethernet connection. The default for this parameter is that all speeds are selected. The recommended setting is a single speed selection for all APs and SMs in the operator network.		
Ethernet Link			
Ethernet Bounce Timeout	See PMP 450m and PMP/PTP 450i Series		
802.3at Type 2 PoE Status	When the PoE Classification functionality is enabled and if Type 2 power is not present, the PAs do not power up and draw too much power.		
and PoE	By default, the PoE Classification feature is disabled, and the PAs will power up regardless of the classification presented by the power source.		
Classification	This is supported only on 450i series ODUs.		
	PoE Classification configuration status also can be check under <b>Home &gt; General &gt;</b> Device Information tab:		
	802 3at Type 2 PoE Status Not Present (Ignored)		
Remote Device Type	See PMP/PTP 450b Series.		
Region	This parameter allows you to set the region in which the radio will operate.		
	The SM radio automatically inherits the Region type of the master. This behavior ignores the value of the Region parameter in the SM, even when the value is None. Nevertheless, since future system software releases may read the value in order to configure some other region-sensitive feature(s), this parameter must be always set to the value that corresponds to the local region.		
Country	This parameter allows you to set the country in which the radio will operate.		

Attribute	Meaning				
	The SM radio automatically inherits the Country Code type of the master. This behavior ignores the value of the Country parameter in the SM, even when the value is None. Nevertheless, since future system software releases may read the value in orde to configure some other region-sensitive feature(s), this parameter must be always se to the value that corresponds to the local region.				
	PMP/PTP 450i Series ODU shipped to the United States is locked to a Region Code setting of "United States". Units shipped to regions other than the United States must be configured with the corresponding Region Code to comply with local regulatory requirements.				
Webpage Auto Update	See PMP 450m and PMP/PTP 450i Series				
Bridge Entry Timeout	Specify the appropriate bridge timeout for correct network operation with the existing network infrastructure. Timeout occurs when the AP encounters no activity with the SM (whose MAC address is the bridge entry) within the interval that this parameter specifies. The Bridge Entry Timeout must be a longer period than the ARP (Address Resolution Protocol) cache timeout of the router that feeds the network.				
	Caution This parameter governs the timeout interval, even if a router in the system has a longer timeout interval. The default value of this field is 25 (minutes).An inappropriately low Bridge Entry Timeout setting may lead to temporary loss of communication with some end users.				
Bridge Table Size	This parameter allows to restrict devices to connect to the SM. It is configurable from 4 to 4096.				
	Note Configure Bridge Table Restriction parameter to Drop packets if MAC address is not in bridge table option to restrict the number of devices configured from connecting to SM.				
Bridge Table Restriction	This parameter allows to either allow or restrict devices to connect to SM using the following options:				
	• Drop packets if MAC address is not in bridge table: Select this option to restrict communication from devices not listed in bridge table.				
	<ul> <li>Forward packets even if MAC address is not in bridge table: Select this option to allow communication from any device.</li> </ul>				
Frame Timing	If this SM extends the sync pulse to a BH master or an AP, select either				
Pulse Gated	Enable: If this SM loses sync from the AP, then do not propagate a sync pulse to the BH timing master or another AP. This setting prevents interference in the event that the SM loses sync.				

Attribute	Meaning
	Disable: If this SM loses sync from the AP, then propagate the sync pulse to the BH timing master or another AP.
Multicast Destination Address	Using Link Layer Discovery Protocol (LLDP), a module exchanges multicast addresses with the device to which it is wired on the Ethernet interface. Although some switches (CMM4, for example) do not pass LLDP addresses upward in the network, a radio can pass it as the value of the Multicast Destination Address parameter value in the connected device that has it populated.
Latitude Longitude Height	Physical radio location data may be configured via the Latitude, Longitude and Height fields. Latitude and Longitude is measured in Decimal Degree while the Height is calculated in Meters.

# General page - PTP 450i BHM

The General page of BHM is explained in below table. The General page of PTP 450 BHM looks the same as PTP 450i BHM.

Table 20: General page attributes - PTP 450i BHM

Link Speeds		<b>D</b>	
Link Speed	Augu 19867 (1887) (1884) (187) (1844 +		
Ethernet Link	# Enabled © Disatved		
Ethernet Bounce Timeout	Minutes (Range: 0-80 Minutes, 0 = Disable)		
PoE			
802 Jai Type 2 PoE Status	Not Present (Ignored)		
PuE Glassification :	Enabled     # Disabled		
Sync Setting			
Sync Input	Germata Sync. *		
Fine Run Before GPS Sync	Enabled Disabled		
Region Settings		- R	
Region :	Qtvar - Hugdatary *		
Country	Ofter +		
Web Page Configuration			
Webpage Auto Update	9 Seconds (0 = Disable Auto Update)		
Bridge Configuration		6	
Bridge Entry Timoout	25 Minutes (Range 25-1440 Minutes)		
Bridging Functionality	© Grazie * Erable		

Update Application information			
Update Application Address R II a D			
TCP Settings			
Prontize TCP ACK	# Enabled © Disabled		
Layer 2 Discovery Destination Address			
Multicast Destination Address	<ul> <li>Broadcast * LLDP Mut</li> </ul>	Broadcast     * LLDP Muticast	
Coontinutes			5
Latitude	+8.000000	Decimal Degree	
Longitude	+0 000000	Decimal Degree	
Height	0	Meters	

Attribute	Meaning		
Link Speed			
Ethernet Link	See PMP 450m and PMP/PTP 450i Series		
Ethernet Bounce Timeout			
802.3at Type 2 PoE Status and	When the PoE Classification functionality is enabled and if Type 2 power is not present, the PAs do not power up and draw too much power.		
PoE Classification	By default, the PoE Classification feature is disabled and the PAs will power up regardless of the classification presented by the power source.		
	This is supported only on 450i Series ODUs.		
	PoE Classification configuration status also can be check under <b>Home &gt; General &gt;</b> Device Information tab:		
	802.3at Type 2 PoE Status : Not Present (Ignored)		
Sync Input	See Configuring synchronization		
Free Run Before GPS Sync	See Free Run Before GPS Sync		
Region	See PMP 450m and PMP/PTP 450i Series		
Country			
Webpage Auto Update			
Bridge Entry Timeout			
Bridging Functionality	Select whether you want bridge table filtering active (Enable) or not (Disable) on this BH.		

Attribute	Meaning		
	Disable: allows user to use redundant BHs without causing network addressing problems. Through a spanning tree protocol, this reduces the convergence tin 25 minutes to few seconds. However, you must disable bridge table filtering a deliberate part of your overall network design since disabling it allows unwant traffic across the wireless interface. Enable: Allows user to enable bridge functionality.		
		Note Specify the appropriate bridge timeout for correct network operation with the existing network infrastructure. The Bridge Entry Timeout must be a longer period than the ARP (Address Resolution Protocol) cache timeout of the router that feeds the network.	
Update Application Address	See PMP 450	m and PMP/PTP 450i Series	
Prioritize TCP ACK			
Multicast Destination Address			
Latitude			
Longitude			
Height			

# General page - PTP 450i BHS

The General page of PTP 450i BHS is explained in below table. The General page of PTP 450 BHS looks the same as PTP 450i BHS.
#### Table 21: General page attributes - PTP 450i BHS

Link Speeds		
Link Speed	Auto 1000F100F100H10F/10H +	
Ethernet Link	* Enabled Disabled	
Ethernet Bounce Timeout	Minutes (Range: 0—80 Minutes, 0 = Disable)	
Pole		
802 3at Type 2 PoE Status	Not Present (ignored)	
PoE Classification .	Enabled     Elisabilit     Disabilit	
Sync Setting		
Remote Device Type	IV PMB:PTP 100 # Other	
Region Settings		
Region .	Other - Regulatory +	
Country	Cittai *	
Web Page Configuration		
Wetpage Auto Update	B Seconds (0 = Disable Auto Update)	
Tendge Configuration		
Bridge Entry Timoout	25. Minutes (Raege: 25-1440 Minutes)	
Bindging Functionality	© Disable ® Enable	
Frame Timing		
Frame Timing Pulse Gated	* Enable (if SM out of sync then do not propagate the transe timeg pulse) Disable (Always propagate the frame timing pulse)	
Layor 2 Discovery Destinution Address		
Multicast Destination Address	Broadcast     * LLDP Muticast	
Groudmaters		
Latitude	-0.000000 Decimal Degree	
Longibide :	+0.000000 Decimal Gegree	
Height	B Meters	

Attribute	Meaning
Link Speed	See PMP 450m and PMP/PTP 450i Series
Ethernet Link	
Ethernet Bounce Timeout	
802.3at Type 2 PoE Status	When the PoE Classification functionality is enabled and if Type 2 power is not present, the PAs do not power up and draw too much power.
and PoE Classification	By default, the PoE Classification feature is disabled and the PAs will power up regardless of the classification presented by the power source.
	This is supported only on 450i Series ODUs.

Attribute	Meaning		
	PoE Classification configuration status also can be check under <b>Home &gt; General &gt;</b> Device Information tab:		
	802.3at Type 2 PoE Status : Not Present (Ignored)		
Remote Device Type	See PMP/PTP 450b Series.		
Region	This parameter allows you to set the region in which the radio will operate.		
	The BHS radio automatically inherits the Region type of the master. This behavior ignores the value of the Region parameter in the BHS, even when the value is None. Nevertheless, since future system software releases may read the value in order to configure some other region-sensitive feature(s), this parameter must be always set to the value that corresponds to the local region.		
Country	This parameter allows you to set the country in which the radio will operate.		
	The BHS radio automatically inherits the Country Code type of the master. This behavior ignores the value of the Country parameter in the BHS, even when the value is None. Nevertheless, since future system software releases may read the value in order to configure some other region-sensitive feature(s), this parameter must be always set to the value that corresponds to the local region.		
	PMP/PTP 450i Series ODU shipped to the United States is locked to a Region Code setting of "United States". Units shipped to regions other than the United States must be configured with the corresponding Region Code to comply with local regulatory requirements.		
Webpage Auto Update	See PMP 450m and PMP/PTP 450i Series		
Bridge Entry Timeout	Specify the appropriate bridge timeout for correct network operation with the existing network infrastructure. Timeout occurs when the BHM encounters no activity with the BHS (whose MAC address is the bridge entry) within the interval that this parameter specifies. The Bridge Entry Timeout must be a longer period than the ARP (Address Resolution Protocol) cache timeout of the router that feeds the network.		
	Caution		
	This parameter governs the timeout interval, even if a router in the system has a longer timeout interval. The default value of this field is 25 (minutes).An inappropriately low Bridge Entry Timeout setting may lead to temporary loss of communication with some end users.		
Bridging Functionality	See PMP 450m and PMP/PTP 450i Series		
Frame Timing	If this BHS extends the sync pulse to a BH master or an AP, select either		
Pulse Gated	Enable—If this BHS loses sync from the BHM, then do not propagate a sync pulse to the BH timing master or other BHM. This setting prevents interference in the event that the BHS loses sync.		

Meaning
Disable—If this BHS loses sync from the BHM, then propagate the sync pulse to the BH timing master or other BHM.
See PMP 450m and PMP/PTP 450i Series
See PMP 450m and PMP/PTP 450i Series

# PMP/PTP 450b Series

General page - PMP 450b SM

The General page of PMP 450b SM is explained in below table.

Table 22: General page attributes - PMP 450b SM

Link Spends	and a second second	
Link Speed	Aute 10007/1007/1004/107/1014 =	
Ethernet Link	* Enabled Disabled Buarce Man Ethernet Part	
Ethernet Bounce Timeout	0 Min	utes (Range: 060 Minutes, 0 = Disable)
Sync Setting		
Sync Aux Port Config	Akprovett Torre	•
Region Settings	CONTROL BARE OF	incore and a second
Region	Cither - Regulat	ay •
Country	Offer 1	
Web Page Configuration		
Webpage Auto Update	o Secon	ds (0 = Onable Auto Update)
Bridge Configuration		a network (Marcala Anna anna anna anna anna anna anna a
Bindge Entry Timoout	25 Mar	utes (Range: 25-1440 Minutes)
Bridge Table Size	2050 (Range 4-4096) (Note: 2 entries in the tirutge table are used for internal purpose)	
Bindge Table Restriction :	<ul> <li>Drop peckets if MAC address is not in bridge table</li> <li>Forward packets even if MAC address is not in bridge table</li> </ul>	
Frame Smith		
Frame Timing Pulse Galed	<ul> <li>Enable (If SM out of sync then do not propagate the trame timing pulse)</li> <li>Disable (Always propagate the trame timing pulse)</li> </ul>	
Layer 2 Discovery Destination Address		
Multicast Destination Address	S Bhadcast # LLDP Muticast	
Coordinates		
Listtude	+e scccco Decimal Degree	
Longitude :	+0.655000 Decimal Degree	
WG291500	6 Meters	

Attribute	Meaning	
Link Speed	From the drop-down list of options, select the type of link speed for the Ethernet connection. The default for this parameter is that all speeds are selected. The recommended setting is a single speed selection for all APs and SMs in the operator network.	
Ethernet Link Enabled/Disabled	Specify whether to enable or disable Ethernet/802.3 connectivity on the wired port of the SM. This parameter has no effect on the wireless link. When you select Enable, this feature allows traffic on the Ethernet/802.3 port. This is the factory default state of the port. When you select Disable, this feature prevents traffic on the port. Typical cases of when you may want to select Disable include:	
	The subscriber is delinquent with payment(s).	
	You suspect that the subscriber is sending or flooding undesired broadcast packets into the network, such as when	
	<ul> <li>a virus is present in the subscriber's computing device.</li> <li>the subscriber's home router is improperly configured.</li> </ul>	
Ethernet Bounce Timeout	This parameter allows the operator to configure Ethernet bounce timeout ranging from 0 to 60 minutes. Value 0 disables Ethernet bounce timeout.	
Sync Aux Port Config	Set the Sync Aux Port Config parameter to support the desired functionality. Select Alignment Tone to output a stereo tone on the Timing Port/UGPS TRRS audio connector for link alignment. Select Sync Output to output the GPS timing pulse on this connector for synchronization of a connected remote AP.	
Remote Device Type	The Remote Device Type parameter is available when Sync Aux Port Config is set to Sync Output. Choose Other unless you are using the 450b Timing Port/UGPS to provide remote synchronization to a PMP/PTP 100 AP/BHM.	
Region	This parameter allows you to set the region in which the radio will operate.	
	The SM radio automatically inherits the Region type of the master. This behavior ignores the value of the Region parameter in the SM, even when the value is None. Nevertheless, since future system software releases may read the value in order to configure some other region-sensitive feature(s), this parameter must be always set to the value that corresponds to the local region.	
Country	This parameter allows you to set the country in which the radio will operate.	
	The SM radio automatically inherits the Country Code type of the master. This behavior ignores the value of the Country parameter in the SM, even when the value is None. Nevertheless, since future system software releases may read the value in order to configure some other region-sensitive feature(s), this parameter must be always set to the value that corresponds to the local region.	
	PMP/PTP 450i Series ODU shipped to the United States is locked to a Region Code setting of "United States". Units shipped to regions other than the United States must be configured with the corresponding Region Code to comply with local regulatory requirements.	

Attribute	Meaning	
Webpage Auto Update	Enter the frequency (in seconds) for the web browser to automatically refresh the web-based interface. The default setting is 0. The 0 setting causes the web-based interface to never be automatically refreshed.	
Bridge Entry Timeout	Specify the appropriate bridge timeout for correct network operation with the existing network infrastructure. Timeout occurs when the AP encounters no activity with the SM (whose MAC address is the bridge entry) within the interval that this parameter specifies. The Bridge Entry Timeout must be a longer period than the ARP (Address Resolution Protocol) cache timeout of the router that feeds the network.	
	4	<b>Caution</b> This parameter governs the timeout interval, even if a router in the system has a longer timeout interval. The default value of this field is 25 (minutes).An inappropriately low Bridge Entry Timeout setting may lead to temporary loss of communication with some end users.
Bridge Table Size	This parame from 4 to 40	eter allows to restrict devices to connect to the SM. It is configurable 096.
	P	<b>Note</b> Configure Bridge Table Restriction parameter to Drop packets if MAC address is not in bridge table option to restrict the number of devices configured from connecting to SM.
Bridge Table Restriction	This parame the followin	eter allows to either allow or restrict devices to connect to SM using g options:
	<ul> <li>Drop packets if MAC address is not in bridge table: Select this option to restrict communication from devices not listed in bridge table.</li> </ul>	
	Forward packets even if MAC address is not in bridge table: Select this option to allow communication from any device.	
Frame Timing	If this SM extends the sync pulse to a BH master or an AP, select either	
Pulse Gated Enable—If this SM loses sync from the AP, then do not propagate a sync p the BH timing master or another AP. This setting prevents interference in event that the SM loses sync.		his SM loses sync from the AP, then do not propagate a sync pulse to ng master or another AP. This setting prevents interference in the he SM loses sync.
	Disable—If this SM loses sync from the AP, then propagate the sync pulse to the BH timing master or another AP.	
Multicast Destination Address	Using Link Layer Discovery Protocol (LLDP), a module exchanges multicast addresses with the device to which it is wired on the Ethernet interface. Although some switches (CMM4, for example) do not pass LLDP addresses upward in the network, a radio can pass it as the value of the Multicast Destination Address parameter value in the connected device that has it populated.	
Latitude Longitude Height	Physical radio location data may be configured via the Latitude, Longitude and Height fields. Latitude and Longitude is measured in Decimal Degree while the Height is calculated in Meters.	

# PTP 450b BHM

Table 23: General page attributes - PMP 450b BHM

Line Speech		Control Control of Con	5
Link Speed	Auto 1000#110	0F/100H/10F/10H + :	
Ethernet Link	* Enabled © Disabled		
Ethernet Bounce Timeout	Minutes (Range 0—60 Minutes 0 = Disable)		
Same Kattlese			
Sync Input	Generate Syn		
Free Run Before GPS Sync	Enabled * Disabled		
Sync Aux Port Config	Same beaut		1
Region Settings			
Region	Other - Regula	101g *)	
Country	Other +	- 075 T	
Web Page Configuration			. 6
Webpage Auto Update	D Seco	ads (0 = Disable Auto Update)	
Bridge Configuration			
Bridge Entry Timeout	25 Minutes (Range: 25—1440 Minutes)		
Bildging Functionality	Disable     # Enable		
Update Application Internation			
Update Application Address	0.845		
TCP Settings			12
Prioritize TCP ACK	* Enabled		
Layer 2 Decovery Destrution Address			
Malicast Destruction Address	Broadcast     # LLDP Mu8cast		
Coordinators			12
Latitude	+1 000000	Decimal Degree	
Longitude	+9.000000	Decimal Degree	
Height.	0	Meters	

Attribute	Meaning
Link Speed	From the drop-down list of options, select the type of link speed for the Ethernet connection. The default for this parameter is that all speeds are selected. The recommended setting is a single speed selection for all APs and SMs in the operator network.
Ethernet Link Enabled/Disabled	Specify whether to enable or disable Ethernet/802.3 connectivity on the wired port of the SM. This parameter has no effect on the wireless link. When you select Enable, this feature allows traffic on the Ethernet/802.3 port. This is the factory default state of the port. When you select Disable, this feature prevents traffic on the port. Typical cases of when you may want to select Disable include: The subscriber is delinquent with payment(s).

Attribute	Meaning		
	You suspect that the subscriber is sending or flooding undesired broadcast packets into the network, such as when		
	<ul> <li>a virus is present in the subscriber's computing device.</li> </ul>		
	• the subscriber's home router is improperly configured.		
Ethernet Bounce Timeout	This parameter allows the operator to configure Ethernet bounce timeout ranging from 0 to 60 minutes. Value 0 disables Ethernet bounce timeout.		
Sync Input	See Configuring synchronization.		
Free Run Before GPS Sync	See Free Run Before GPS Sync		
Sync Aux Port Config	See Sync Aux Port Config		
Region	From the drop-down list, select the region in which the radio is operating.		
Country	From the drop-down list, select the country in which the radio is operating.		
	Unlike selections in other parameters, your Country selection requires a Save Changes and a Reboot cycle before it will force the context-sensitive GUI to display related options (for example, Alternate Frequency Carrier 1 and 2 in the Configuration > Radio tab).		
	PMP 450b Series ODUs shipped to the United States is locked to a Region Code setting of "United States". Units shipped to regions other than the United States must be configured with the corresponding Region Code to comply with local regulatory requirements. Country Code settings affect the radios in the following ways:		
	<ul> <li>Maximum transmit power limiting (based on radio transmitter power plus configured antenna gain)</li> <li>DFS operation is enabled based on the configured region code, if applicable</li> </ul>		
	For more information on how transmit power limiting and DFS is implemented for each country, see the PMP 450 Planning Guide.		
Webpage Auto Update	Enter the frequency (in seconds) for the web browser to automatically refresh the web-based interface. The default setting is 0. The 0 setting causes the web-based interface to never be automatically refreshed.		
Bridge Entry Timeout	Specify the appropriate bridge timeout for correct network operation with the existing network infrastructure. The Bridge Entry Timeout must be a longer period than the ARP (Address Resolution Protocol) cache timeout of the router that feeds the network.		
Bridging Functionality	Select whether you want bridge table filtering active (Enable) or not (Disable) on this BH.		

Attribute	Meaning		
	Disable: allows user to use redundant BHs without causing network addressing problems. Through a spanning tree protocol, this reduces the convergence time from 25 minutes to few seconds. However, you must disable bridge table filtering as only a deliberate part of your overall network design since disabling it allows unwanted traffic across the wireless interface.		
	Enable: Allows user to enable bridge functionality.		
	Note Specify the appropriate bridge timeout operation with the existing network infr Timeout must be a longer period than the Protocol) cache timeout of the router the	Note Specify the appropriate bridge timeout for correct network operation with the existing network infrastructure. The Bridge Entry Timeout must be a longer period than the ARP (Address Resolution Protocol) cache timeout of the router that feeds the network.	
Update Application Address	Enter the address of the server to access for software updates on this BHM and registered BHS.		
Prioritize TCP ACK	To reduce the likelihood of TCP acknowledgement packets being dropped, set this parameter to Enabled. This can improve throughput that the end user perceives during transient periods of congestion on the link that is carrying acknowledgements.		
Multicast Destination Address	Using Link Layer Discovery Protocol (LLDP), a module exchanges multicast addresses with the device to which it is wired on the Ethernet interface. Although some switches (CMM4, for example) do not pass LLDP addresses upward in the network, a radio can pass it as the value of the Multicast Destination Address parameter value in the connected device that has it populated.		
Latitude Longitude Height	Physical radio location data may be configured via the Latitude, Longitude and Height fields. Latitude and Longitude is measured in Decimal Degree while the Height is calculated in Meters.		

## PTP 450b BHS

Table 24: General page attributes - PMP 450b BHS

Link Speeds		
Link Speed	Avio 1000F-100F-100H11F-10H +	
Ethernet Unit	* Enabled Disabled Barrie Main Ethernal Part	
Ethernet Bounce Timeout	8 Minutes (Range: 0—80 Minutes; 0 + Disable)	
Sync Satting		
Sync Aux Port Config	Algoriant Tora +	
Region Settings		
Region	(fore	
Web Page Configuration		
Webpage Auto Update	B Seconds (0 + Disable Auto Update)	
Bridge Configuration		
Bridge Entry Timeout	35 Minutes (Range: 251440 Minutes)	
Bridging Functionality	Desable     # Enable	
Frame Timing		
Frame Timing Pulse Geled	* Enable (if SM out of sync then do not propagate the frame timing pulse) © Disable (Always propagate the frame timing pulse)	
Layur 2 Discovery Destination Address		
Multicast Destruction Address	© Broadcast # LLDP Muthcast	
Countrialies		
Latitude	+e secto Decimal Degree	
Longitude :	-0.000000 Decimal Degree	
Height	8 Meters	

Attribute	Meaning
Link Speed	From the drop-down list of options, select the type of link speed for the Ethernet connection. The Auto settings allow the two ends of the link to automatically negotiate with each other the best possible speed, and check whether the Ethernet traffic is full duplex or half duplex.
	However, some Ethernet links work best when either:
	<ul> <li>both ends are set to the same forced selection</li> </ul>
	<ul> <li>both ends are set to auto-negotiate and both have capability in least one common speed and traffic type combination.</li> </ul>
Ethernet Link	This parameter allows the operator to enable or disable Ethernet Link.
Ethernet Bounce Timeout	This parameter allows the operator to configure Ethernet bounce timeout ranging from 0 to 60 minutes. Value 0 disables Ethernet bounce timeout.

Attribute	Meaning		
Sync Aux Port Config	Set the Sync Aux Port Config parameter to support the desired functio Alignment Tone to output a stereo tone on the Timing Port/UGPS TRR connector for link alignment. Select Sync Output to output the GPS tim this connector for synchronization of a connected remote AP.	nality. Select S audio ning pulse on	
Remote Device Type	The Remote Device Type parameter is available when Sync Aux Port C Sync Output. Choose Other unless you are using the 450b Timing Port, provide remote synchronization to a PMP/PTP 100 AP/BHM.	onfig is set to /UGPS to	
Region	This parameter allows you to set the region in which the radio will oper	ate.	
	The BHS radio automatically inherits the Region type of the master. This behavior ignores the value of the Region parameter in the BHS, even when the value is None. Nevertheless, since future system software releases may read the value in order to configure some other region-sensitive feature(s), this parameter must be always set to the value that corresponds to the local region.		
Country	This parameter allows you to set the country in which the radio will ope	erate.	
	The BHS radio automatically inherits the Country Code type of the mass behavior ignores the value of the Country parameter in the BHS, even is None. Nevertheless, since future system software releases may read order to configure some other region-sensitive feature(s), this parameter always set to the value that corresponds to the local region.	ter. This when the value the value in er must be	
	PMP/PTP 450b Series ODU shipped to the United States is locked to a setting of "United States". Units shipped to regions other than the Unite be configured with the corresponding Region Code to comply with loc requirements.	450b Series ODU shipped to the United States is locked to a Region Code 'United States". Units shipped to regions other than the United States must red with the corresponding Region Code to comply with local regulatory nts.	
Webpage Auto Update	Enter the frequency (in seconds) for the web browser to automatically web-based interface. The default setting is 0. The 0 setting causes the interface to never be automatically refreshed.	refresh the web-based	
Bridge Entry Timeout	Specify the appropriate bridge timeout for correct network operation with the existing network infrastructure. The Bridge Entry Timeout must be a longer period than the ARP (Address Resolution Protocol) cache timeout of the router that feeds the network.		
Bridging Functionality	Select whether you want bridge table filtering active (Enable) or not (Disable) on this BH.		
	Disable: allows user to use redundant BHs without causing network addressing problems. Through a spanning tree protocol, this reduces the convergence time from 25 minutes to few seconds. However, you must disable bridge table filtering as only a deliberate part of your overall network design since disabling it allows unwanted traffic across the wireless interface.		
	Enable: Allows user to enable bridge functionality.		
	Note		

Attribute	Meaning	
	s v t	Specify the appropriate bridge timeout for correct network operation with the existing network infrastructure. The Bridge Entry Timeout must be a longer period than the ARP (Address Resolution Protocol) cache simeout of the router that feeds the network.
Frame Timing	If this BHS ext	tends the sync pulse to a BH master or an AP, select either
Pulse Gated	Enable—If this BH timing ma the BHS loses	s BHS loses sync from the AP, then do not propagate a sync pulse to the ster or another AP. This setting prevents interference in the event that sync.
	Disable—If thi timing master	is BHS loses sync from the BHM, then propagate the sync pulse to the BH r or another AP.
Multicast Destination Address	Using Link La with the devic (CMM4, for ex pass it as the connected de	yer Discovery Protocol (LLDP), a module exchanges multicast addresses ce to which it is wired on the Ethernet interface. Although some switches kample) do not pass LLDP addresses upward in the network, a radio can value of the Multicast Destination Address parameter value in the evice that has it populated.
Latitude	Physical radic	location data may be configured via the Latitude, Longitude and Height
Longitude Height	Latitude and I in Meters.	Longitude is measured in Decimal Degree while the Height is calculated

# General page - PMP 450b Retro SM

#### Figure 23: General page attributes - PMP 450b Retro SM

Attribute	Meaning
Link Speed	
Ethernet Link	
Ethernet Bounce Timeout	
Configuration Source	
Sync Input	
Free Run Before GPS Sync	

Attribute	Meaning
Region	
Country	
Webpage Auto Update	
Bridge Entry Timeout	
Translation Bridging	
Send Untranslated ARP	
SM Isolation	
Forward Unknown Unicast Packets	
Update Application Address	
Prioritize TCP ACK	
Multicast Destination Address	
DHCP Relay Agent	
DHCP Server (Name or IP Address)	
Option 82 Circuit ID	
Option 82 Remote ID	
Option 82 Vendor Specific ID	
Latitude	
Longitude	
Height	

# PMP/PTP 450 Series



## Note

Refer PMP 450m and PMP/PTP 450i Series and General page attributes – PMP 450i SM for PMP 450 AP/SM General page parameters details.

# General page - PMP 450 AP

## Figure 24: General page attributes - PMP 450 AP

Link Speeds		
Link Speed :	Auto 1000F/10	00F/100H/10F/10H +
Ethernet Link :	Enabled     Disabled	
Ethernet Bounce Timeout :	0 Mi	inutes (Range : 0-60 Minutes, 0 = Disable)
Bandwidth Configuration Source		
Configuration Source :	SM	•
Sine Setting		
Sync input :	Generate Syn	¢ •
Free Run Before GPS Sync :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	
Region Settings		
Region :	Other - Regula	atory •
Country :	Other •	
Web Page Configuration		-
Webpage Auto Update :	0 Seco	nds (0 = Disable Auto Update)
Bridge Configuration		
Bridge Entry Timeout :	25 M	inutes (Range : 25-1440 Minutes)
Translation Bridging :	© Enabled ® Disabled	
Send Untranslated ARP :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	
SM Isolation :	Disable SM is	olation •
Forward Unknown Unicast Packets :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	If destination address is not known, forward packet to all SMs. - If destination address is not known, drop packet.
Update Application Information		
Update Application Address :	0.0.0.0	
TCP Settings		
Prioritize TCP ACK	Enabled	
Phones for Marc.	Disabled	
Layer 2 Discovery Destination Address		
Multicast Destination Address :	<ul> <li>Broadcas</li> <li>ELDP Mu</li> </ul>	t löcast
DHCP Relay Agent		
DHCP Relay Agent :	Disable	7
DHCP Server (Name or IP Address) :	<ul> <li>Append D</li> <li>Disable D</li> <li>255 255 255 25</li> </ul>	INS Domain Name NS Domain Name 55
Option 82 Circuit ID :	SapmachiS	
Option 82 Remote ID :	\$smmacb1\$	
Option 82 Vendor Specific ID :	\$smridbi\$	
Coordinates		
Latitude :	+42 052912	Decimal Degree
Longitude :	-88.025598	Decimal Degree
Height :	0	Meters

Attribute	Meaning
Link Speed	See General page attributes - PMP 450i SM
Ethernet Link	
Ethernet Bounce Timeout	
Configuration Source	
Sync Input	
Free Run Before GPS Sync	
Region	
Country	
Webpage Auto Update	
Bridge Entry Timeout	
Translation Bridging	
Send Untranslated ARP	
SM Isolation	
Forward Unknown Unicast Packets	See General page attributes - PMP 450i SM
Update Application Address	
Prioritize TCP ACK	
Multicast Destination Address	
DHCP Relay Agent	
DHCP Server (Name or IP Address)	
Option 82 Circuit ID	
Option 82 Remote ID	
Option 82 Vendor Specific ID	
Latitude	
Longitude	
Height	

# General page - PMP 450 SM

Table 25: General page attributes - PMP 450 SM

Link Speeds		E
Link Speed :	Auto 100F/100	HV10F/10H *
Ethernet Link :	Enabled	
Cardenary Frank :	Oisabled	
	Bounce M	ain Ethernet Port
Ethernet Bounce Timeout :	0 Mi	nutes (Range : 0-60 Minutes, 0 = Disable)
Sync Setting		8
Demote Device Time :	© PMP/PTP	100
Remote Device Type :	* Other	
Region Settings		8
Region :	Other - Regula	itary *
Country :	Other *	
Web Page Configuration		
Webpage Auto Update :	a Seco	nds (0 = Disable Auto Update)
Trespage risk spane :		ina (o - original state of analy
Bridge Configuration		E.
Bridge Entry Timeout :	25 Mi	nutes (Range : 25—1440 Minutes)
Bridge Table Size :	4096 (R purpose)	ange : 44096) (Note: 2 entries in the bridge table are used for internal
Bridge Table Restriction :	Drop pack	ets if MAC address is not in bridge table
	Forward p	ackets even if MAC address is not in bridge table
Frame Timing		8
Frame Timing Pulse Gated :	Enable (If Disable (#	SM out of sync then do not propagate the frame timing pulse) Wways propagate the frame timing pulse)
Layer 2 Discovery Destination Address		
Multicast Destination Address	Broadcast	
manuasi Destributi Address .	ILDP Mul	licast
Coordinates		E
Latitude :	+0.000000	Decimal Degree
Longitude :	+0.000000	Decimal Degree
Height :	0	Meters

Attribute	Meaning
Link Speed	
Ethernet Link Enable/Disable	
Ethernet Bounce Timeout	
Remote Device Type	
Region	
Country	
Webpage Auto Update	
Bridge Entry Timeout	
Bridge Table Size	See General page attributes – PMP 450i SM
Bridge Table Restriction	
Frame Timing Pulse Gated	
Multicast Destination Address	
Latitude	
Longitude	
Height	

# General page - PTP 450 BHM

## Figure 25: General page attributes - PTP 450 BHM

Link Speeds		
Link Speed :	Auto 100F/100	H/10F/10H +
Ethernet Link :	Enabled	
	Bounce M	ain Ethernet Port
Ethernet Bounce Timeout :	0 Mi	nutes (Range : 0-60 Minutes, 0 = Disable)
Sync Setting		
Sync Input :	Generate Syne	
Free Run Before GPS Sync :	Enabled	
Region Settings		
Region :	Other - Regula	tary *
Country :	Other •	
Web Page Configuration		
Webpage Auto Update :	0 Seco	nds (0 = Disable Auto Update)
Bridge Configuration		
Bridge Entry Timeout :	25 Mi	nutes (Range : 25-1440 Minutes)
Bridging Functionality :	Disable     Enable	
Update Application Information		
Update Application Address :	0.0.0.0	
TCP Settings		
Prioritize TCP ACK :	Enabled Disabled	
Layer 2 Discovery Destination Address		
Multicast Destination Address :	Broadcast     # LLDP Mul	licast
Coordinates		
Latitude :	+0.000000	Decimal Degree
Longitude :	+0.000000	Decimal Degree
Height :	0	Meters

Attribute	Meaning
Link Speed	See General page attributes - PTP 450i BHM
Ethernet Link	
Ethernet Bounce Timeout	
Sync Input	
Free Run Before GPS Sync	
Region	
Country	
Webpage Auto Update	
Bridge Entry Timeout	
Bridging Functionality	
Update Application Address	
Prioritize TCP ACK	
Multicast Destination Address	
Latitude	
Longitude	
Height	

# General page - PTP 450 BHS

## Figure 26: General page attributes - PTP 450 BHS

Link Speeds	E
Link Speed :	Auto 100F/100H/10F/10H *
Ethernet Link :	* Enabled
	Disabled
	Bounce Main Ethernet Port
Ethernet Bounce Timeout :	Minutes (Range : 0—60 Minutes, 0 = Disable)
Sync Setting	e,
Remote Device Tune :	PMP/PTP 100
Remote Device Type .	* Other
Region Settings	8
Region :	Other - Regulatory *
Country :	Other *
Web Page Configuration	8
Webpage Auto Update :	<ul> <li>Seconds (0 = Disable Auto Update)</li> </ul>
Bridge Configuration	8
Bridge Entry Timeout :	25 Minutes (Range : 25—1440 Minutes)
Bridaina Euroctionality :	0 Disable
bridging Poncoordany.	* Enable
Frame Timing	2
Frame Timing Frame Timing Duise Gated :	* Enable (If SM out of sync then do not propagate the frame timing pulse)
Frame Timing Frame Timing Pulse Gated :	<ul> <li>Enable (If SM out of sync then do not propagate the frame timing pulse)</li> <li>Disable (Always propagate the frame timing pulse)</li> </ul>
Frame Timing Frame Timing Pulse Gated : Layer 2 Discovery Destination Address	Enable (If SM out of sync then do not propagate the frame timing pulse)     Disable (Always propagate the frame timing pulse)
Frame Timing Frame Timing Pulse Gated : Layer 2 Discovery Destination Address Multicast Destination Address :	Enable (If SM out of sync then do not propagate the frame timing pulse)     Disable (Always propagate the frame timing pulse)     Broadcast
Frame Timing Frame Timing Pulse Gated : Layer 2 Discovery Destination Address Multicast Destination Address :	Enable (If SM out of sync then do not propagate the frame timing pulse)     Disable (Always propagate the frame timing pulse)     Broadcast     LLDP Multicast
Frame Timing Frame Timing Pulse Gated : Layer 2 Discovery Destination Address Multicast Destination Address : Coordinates	Enable (If SM out of sync then do not propagate the frame timing pulse)     Disable (Always propagate the frame timing pulse)     Broadcast     ELDP Multicast
Frame Timing Frame Timing Pulse Gated : Layer 2 Discovery Destination Address Multicast Destination Address : Coordinates Latitude :	Enable (If SM out of sync then do not propagate the frame timing pulse)     Disable (Always propagate the frame timing pulse)     Broadcast     ELLDP Multicast     topped Decimal Degree
Frame Timing Frame Timing Pulse Gated : Layer 2 Discovery Destination Address Multicast Destination Address : Coordinates Latitude : Longitude :	Enable (If SM out of sync then do not propagate the frame timing pulse)     Disable (Always propagate the frame timing pulse)     Broadcast     ELLDP Multicast      +0.000000     Decimal Degree     +0.00000     Decimal Degree

Attribute	Meaning
Link Speed	See General page - PTP 450i BHS
Ethernet Link	
Ethernet Bounce Timeout	
Remote Device Type	
Region	
Country	
Webpage Auto Update	
Bridge Entry Timeout	
Bridging Functionality	
Frame Timing Pulse Gated	
Multicast Destination Address	
Latitude	
Longitude	
Height	

# General page - PMP 450 MicroPoP AP

Table 26: General page attributes - PMP 450 MicroPoP AP

Link Speeds	
Link Speed :	Auto 1000F/100F/100H/10F/10H w
Ethernet Link :	Enabled     Oisabled
Ethemet Bounce Timeout :	<ul> <li>Minutes (Range : 0—60 Minutes, 0 = Disable)</li> </ul>
Bandwidth Configuration Source	
Configuration Source	3M 👻
Sync Setting	
Sync Input :	Generate Bync w
Free Run Before GPS Sync :	Pleabled
GNSS Mode :	GPS GLONASS Galleo Beidou
Region Settings	
Region :	Other - Regulatory w
Country :	Other V
Web Page Configuration	
Webpage Auto Update :	1 Seconds (0 = Disable Auto Update)
Bridge Configuration	
Bridge Entry Timeout :	25 Minutes (Range : 251440 Minutes)
Translation Bridging :	Enabled     Disabled
Send Untranslated ARP :	C Enabled Disabled
SM Isolation :	Deaths SM isolation w
Forward Unknown Unicast Packets	C Enabled - If destination address is not known, forward packet to all SMs. Disabled - If destination address is not known, drop packet.

Update Application Information				
Update Application Address		10 130 247 85		
TCP Settings				
Prioritize TCP ACK :	_	<ul> <li>Enabled</li> <li>Disabled</li> </ul>		
Layer 2 Discovery Destination A	dd/ess			
Multicast Destination Address :	_	Broadcast     LLDP Mult	licast	
DHCP Relay Agent				
DHCP Relay Agent :	Disation		•	
DHCP Server (Name or IP Address) :	Append Disable 255 255 251	DNS Domain DNS Domain 5255	Name	
Option 82 Circuit ID :	Separat 15			
Option 82 Remote ID :	formacitis			
Option 82 Vendor Specific ID :	Invidia			
Coordinates				
Latitude :		+0.000000	Decimal Degree	
Longitude :		+0.000000	Decimal Degree	

Attribute	Meaning
Link Speed	See General page attributes - PMP 450i SM
Ethernet Link	
Ethernet Bounce Timeout	
Configuration Source	
Sync Input	
Free Run Before GPS Sync	
GNSS Mode	GPS:
	GLONASS:
	Galileo:
	Beidou:

Meters.

6

Height :

Attribute	Meaning
Region	See General page attributes - PMP 450i SM
Country	
Webpage Auto Update	
Bridge Entry Timeout	
Translation Bridging	
Send Untranslated ARP	
SM Isolation	
Forward Unknown Unicast Packets	
Update Application Address	
Prioritize TCP ACK	
Multicast Destination Address	
DHCP Relay Agent	
DHCP Server (Name or IP Address)	
Option 82 Circuit ID	
Option 82 Remote ID	
Option 82 Vendor Specific ID	
Latitude	
Longitude	
Height	

# General page - 450v AP

## Figure 27: General page attributes - 450v AP

Link Speeds	AND MANAGEMENT AND	-
Lvw Speed .	Aut 1007 1007 1008 107 101 w	
EthernetLink	Charlied	
Enternet Boutce Termoul	Minutes (Range: 0-60 Minutes, 0 = Disable)	
Bandwath Contiguration Source		
Canfiguration Boards	14. v	
Sync Setting	N 11111	
Sync input	(Autolyn) - Fies Rut +	
Free Hun Belon OPS Sync.	Enabled     Department	
Denvis Tune :	· Standard	
Barris (pr.	ORemote	
Sync nur Fan Conng	C Enabled	
Aux Part Prover to UDPS :	# Creatied	
CPS Sathaga		
Verify GPS Message Checkson :	* Erwbied	
	C Coladini)	
Ragon Sellings		
Chiefty	Total Latte V	
All statements and statements a		
Webpage Aidg-Update	1 Seconds (7) = Detable 6, 40 (Jointe)	
And the second second	AN - MUSER ON AND A STREAM OF T	
Bridge Citrifiquiption	14 Minutes Parties 78 - 1440 Minutes	
broge brog investor	CErabled	
Transition Bridging	Cisabled	
Send Universided ARP	Erabled     Postant	
SW Isolation	Durine Bill Sultation · · ·	
Forward University Discard Pacinets	Enabled - If destination address is not known, forward packet to all SMs.	
No. 200 - Diversion of the construction		
and the second		
Under Activities Address	1111	
TCPSettigs	· Etubert	
Phone TOP ACK	Obsetient	
Lawred Uncovery		
Multi-add Development Address	Cervedcert	
And a second sec	<ul> <li>LDP Multical</li> <li>Entry 14 34 (840) Configuration</li> </ul>	
VLAN Jagping of LLDP Factors	C Always Untagged	
DHCP Role Agent		=
DHCP, Rolay Agent :	(Diable 4)	
DHCP Server (Nerve or IP Address)	Appoint ONE Durison Name Douation DNB Durison Nette	
Desired BT Concept (D)	Superior .	
Option by Orbait O		
Option 62 Remark (D	And a second	
Option #2 Vendor Specific ID	3-001	
Note: DHCPv6 relay is supported only in "Insert Option 82" read		
Coordinates		
Lattate	+E30000 Decimal Degree	
Longsude	-6 800000 Decimal Degree	
(Hegn:	a Metera	
SM Reconsideri		R
Report SM Reconnection Failure After Channel ERP Change	Erabe     Chaster	
Failure Reporting Threshold for BM Reconnection	0 5	
Failure Report Duration	J Days (Garge: 1 30)	

Attribute	Meaning
Link Speed	See PMP 450m and PMP/PTP 450i Series
Ethernet Link	
Ethernet Bounce Timeout	
Configuration Source	
Sync Input	
Free Run Before GPS Sync	
Device Type	<ul> <li>Standard: Specifies that the device operates as a standard unit.</li> </ul>
	• <b>Remote</b> : Specifies that the device's AUX port is daisy- chained to an SM's AUX port to provide the 1PPS pulse to the AP.
Sync Aux Port Config	Set the <b>Sync Aux Port Config</b> parameter to support the desired functionality. Select Sync Output to output the GPS timing pulse on this connector for synchronization of a connected remote AP.
Aux Port Power to UGPS	Enables the Aux Port Power to UGPS parameter to output power on the port.
Verify GPS Message Checksum	This parameter enables or disables the validation of incoming GPS location messages. When enabled, the AP discards messages found to have an incorrect checksum and increments the Invalid Message Count displayed on the Sync Status tab of the Home GUI page accordingly.
Region	See PMP 450m and PMP/PTP 450i Series
Country	
Webpage Auto Update	
Bridge Entry Timeout	
Translation Bridging	
Send Untranslated ARP	
SM Isolation	
Forward Unknown Unicast Packets	
Update Application Address	
Prioritize TCP ACK	
Multicast Destination Address	
VLAN tagging of LLDP Packets	<ul> <li>Follow VLAN MVID Configuration: Indicates that VLAN tagging of LLDP packets follows the VLAN MVID (Management VLAN ID) configuration.</li> </ul>

Attribute	Meaning
	<ul> <li>Always Untagged: Specifies that LLDP packets are always sent untagged, regardless of the VLAN configuration.</li> </ul>
DHCP Relay Agent	See PMP 450m and PMP/PTP 450i Series
DHCP Server (Name or IP Address)	
Option 82 Circuit ID	
Option 82 Remote ID	
Option 82 Vendor Specific ID	
Latitude	
Longitude	
Height	
Report SM Reconnection Failure After Channel/EIRP Change	
Failure Reporting Threshold for SM Reconnection	
Failure Report Duration	

# General page - 450v SM

## Figure 28: General page attributes - 450v SM

Link Epsede		
Link Spood :	Auto 10(0F 100F 100F 100F 10F 10F 10F 10F	
Ethamet Link	* Erudiked	
	Obabid	
CHARLES FROM STATE	Hunter (Darris Part	
Epainet boutce teneout :	s (Merican (Peargle : 041 Merican, 0 + Lautre)	
OPS Setting		
Varity GPS Massage Checksum :	Enabled	
Aux Post Circles	(US Date -	
	CEresteel	
Aux Port Power to UGPS :	Disabled	
Region General		
Region ::	(https://williams.com/	
Web Dava Configuration		
Webpers Acto Dotter	Seconda (D = Disable Auto Update)	
Look and a construction of the		
Bridge Configuration		
Bridge Entry Timeout :	20 Minutes (Range : 25–1440 Minutes)	
Bridge Table Size :	ense (Range : 44000) (Note: 2 entries in the bridge table are used for internal purpose)	
Bridge Table Hashholton	O Drop packets if MAC address is not in bridge table	
	<ul> <li>Forward packets exem if MAC address is not in bridge table</li> </ul>	
Frame Timing	Contracting of the second s	
Frame Timing Pulse Galed	<ul> <li>Enable (If SM out of sync then to not propagate the trans timing pulse)</li> </ul>	
	C Disable (Amays propagate the hame timing pulse)	
Layer 2 Discovery		
Multicard Destination Address	© Browdcawt	
	<ul> <li>LLDP Multicalit</li> </ul>	
VLAN tagging of LLOP Packets	Fallow VLAN MVID Catiliguistion	
	Contraction Attractions	
Coordinates		
Lattade	+0.00000 Decimal Degree	
Longhide :	<0.000000 Decenal Degree	
Pleight	Ta Abataris	

Attribute	Meaning
Link Speed	See General page - PMP 450i SM
Ethernet Link	
Ethernet Bounce Timeout	
Verify GPS Message Checksum	This parameter enables or disables the validation of incoming GPS location messages from a UGPS or cnPulse module connected to the AP's Aux Port. When enabled, the AP discards messages found to have an incorrect checksum and increments the Invalid Message Count displayed on the <b>Sync Status</b> tab of the Home GUI page accordingly.
Aux Port Config	Set the Aux Port Config parameter to support the desired functionality. Select Alignment Tone to output a stereo tone on the Timing Port/UGPS TRRS audio connector for link alignment. Select Sync Output to output the GPS timing pulse on this connector for synchronization of a connected remote AP.

Attribute	Meaning
Region	See General page - PMP 450i SM
Country	
Webpage Auto Update	
Bridge Entry Timeout	
Bridge Table Size	
Bridge Table Restriction	
Frame Timing Pulse Gated	
Multicast Destination Address	
VLAN tagging of LLDP Packets	
Latitude	
Longitude	
Height	

# **Configuring Unit Settings page**

The Unit Settings page of the 450 Platform Family contains following options:

- Unit-Wide Changes
- Download Configuration File
- Upload and Apply Configuration File (for AP and BHM)
- LED Panel Settings (for SM and BHS)



## Note

LED Panel setting is applicable for SM and BHS only.

Upload and Apply Configuration File attributes are not supported for SM and BHS.

The 450 Platform Family also supports import and export of configuration from the AP/BHM/SM/BHS as a text file. The configuration file is in JSON format. The logged in user must be an ADMINISTRATOR in order to export or import the configuration file.

The exported configuration file contains the complete configuration including all the default values. To keep a backup of the current configuration, the file can be saved as-is and imported later.

The configuration file supports encrypted password. The exported configuration file will contain encrypted password. The import of configuration can have either encrypted or plain text password in Configuration fie. A new tab Encrypt the Password is added under Encrypted Password tab to generate encrypted password for a given password.

The Import and Export procedure of configuration file is described in Import and Export of config file.

LED Panel Mode has options select Revised mode and Legacy mode. The Legacy mode configures the radio to operate with standard LED behavior.

# Unit Settings page of 450 Platform Family - AP/BHM

The Unit Setting page of AP/BHM is explained in below table.

Table 27: Unit Settings attributes - 450 Platform Family AP/BHM

Cot To Fostory Defaults Upon D	afault Enabled	
Set To Factory Defaults Opon Di	elault le Enabled	
Plug Mode Detection	<ul> <li>Disabled</li> </ul>	_
Unit-Wide Changes		
Undo l	Jnit-Wide Saved Changes    Set to Factory Defaults	
Encrypt the Password		
Password :		
Encrypted Password :		
	Encrypt the password	
		56
Download Configuration File		
Configuration File	<u>Uau03ea13575.ctg</u>	
Upload and Apply Configuration	Files	
File Choose File No file chos	en	
Linioad		
opicad		

Status of Configuration File

Attribute	Meaning		
Set to Factory Defaults Upon Default Mode Detection	If Enabled is check rebooted with De and no password technician, or oth override cannot s If Disabled is check	cked, then the default mode functions is enabled. When the module is efault mode enabled, it can be accessed at the IP address 169.254.1.1 I, and all parameter values are reset to defaults. A subscriber, her person who gains physical access to the module and uses an see or learn the settings that were previously configured in it. cked, then the default mode functions are disabled.	
	Cau Whe radi Sele	tion en Set to Factory Defaults Upon Default Mode is set to Enable, the o does not select all of the frequencies for Radio Frequency Scan ection List. It needs to be selected manually.	

Attribute	Meaning				
Undo Unit- Wide Saved Changes	When you click this button, any changes that you made in any tab but did not commit by a reboot of the module are undone.				
Set to Factory Defaults	When you click this button, all configurable parameters on all tabs are reset to the factory settings.				
	Note This can be reverted by selecting "Undo Unit-Wide Saved Changes", before rebooting the radio, though this is not recommended.				
Password	This allows to provide encrypted password for a given password. On click of 'Encrypt the password' button, the Encrypted Password field will display encrypted value of entered plain text password in 'Password' field.				
	Encrypt the Password				
	Password ·····				
	Encrypted Password 54e06861bcf9710630513dadefbf7ff8 Encrypt the password				
Configuration File	This allows to download the configuration file of the radio. This configuration file contains the complete configuration including all the default values. The configuration file is highlighted as downloadable link and the naming convention is " <mac address="" ap="" of="">.cfg".</mac>				
Apply	This allows to import and apply configuration to the AP.				
Configuration File	Chose File: Select the file to upload the configuration. The configuration file is named as " <file name="">.cfg".</file>				
	Upload: Import the configuration to the AP.				
	Apply Configuration File: Apply the imported configuration file to the AP. The imported configuration file may either contain a full device configuration or a partial device configuration. If a partial configuration file is imported, only the items contained in the file will be updated, the rest of the device configuration parameters will remain the same. Operators may also include a special flag in the configure file to instruct the device to first revert to factory defaults then to apply the imported configuration.				
Status of Configuration file	This section shows the results of the upload.				

# Unit Settings page of PMP/PTP 450i SM/BHS

The Unit Settings page of PMP/PTP 450i SM/BHS is explained in below table.

#### Table 28: SM Unit Settings attributes

Default Plug Mode		
Set To Factory Defaults Upon Default Plug	© Enabled	
Mode Detection	* Disabled	
LED Panel Settings		11
LED Panel Mode	Revised Mode (Optimized For Indoor SM)	
	* Legacy Mode	
Unit-Wide Changes		
Undo Unit-Wid	e Saved Changes   Set to Factory Defaults	
Encrypt the Password		
Password :		
Encrypted Password		
	Encrypt the password	
Download Configuration File		
Configuration File	0a003e30a066.cfg	
Upload and Apply Configuration File		
Configuration file import is currently unsupport	orted over the web proxy.	
Status of Configuration File		

Attribute	Meaning
Set to Factory Defaults Upon Default Plug Detection	See Unit Settings page of 450 Platform Family - AP/BHM
LED Panel Settings	Legacy Mode configures the radio to operate with standard LED behavior.
Undo Unit-Wide Saved Changes	See Unit Settings page of 450 Platform Family - AP/BHM
Password	
Set to Factory Defaults	
Configuration File	
Status of Configuration file	

# Setting up time and date

# Time page of 450 Platform Family - AP/BHM

Applicable products	PMP:	þ	AP	PTP:	þ	внм
---------------------	------	---	----	------	---	-----

The Time page of 450 Platform Family AP/BHM is explained in below table.

#### Table 29: 450 Platform Family - AP/BHM Time attributes

NTP Server Configuration		
NTP Server (Name or IP Address) :	<ul> <li>Append DNS Domain Name</li> <li>Disable DNS Domain Name</li> </ul>	
NTP Server 1 (Name or IP Address) :	pool.ntp.org	
NTP Server 2 (Name or IP Address) :	0.0.0.0	
NTP Server 3 (Name or IP Address) :	0.0.0.0	
NTP Server(s) In Use :	pool.ntp.org (108.61.73.244)	
	Get Time via NTP	

Current System Time				
Time Zone :	UTC : (UTC) Coordinated Universal Time	•		
System Time :	20:33:13 06/26/2013 UTC			
Last NTP Time Update :	20:32:07 06/26/2013 UTC			

Time and Date		E
Time :	20 : 33 : 13 UTC	
Date :	06 / 26 / 2013	
l	Set Time and Date	

NTP Update Log 06/26/2013 : 20:32:07 UTC : Clock Updated, Server 1

Attribute	Meaning
NTP Server (Name or IP Address)	The management DNS domain name may be toggled such that the name of the NTP server only needs to be specified and the DNS domain name is automatically appended to that name.
NTP Server 1 (Name or IP Address) NTP Server 2 (Name or IP Address) NTP Server 3 (Name or IP Address)	<ul> <li>To have each log in the AP/BHM correlated to a meaningful time and date, either a reliable network element must pass time and date to the AP/BHM or must set the time and date whenever a power cycle of the AP/BHM has occurred. A network element passes time and date in any of the following scenarios: <ul> <li>A connected CMM4 passes time and date (GPS time and date, if received).</li> <li>A connected CMM4 passes the time and date (GPS time and date, if received), but only if both the CMMr is operating on CMMr Release 2.1 or later release. (These releases include NTP server functionality.)</li> <li>A separate NTP server (including APs/BHMs receiving NTP data) is addressable from the AP/BHM.</li> </ul> </li> <li>If the AP/BHM needs to obtain time and date from a CMM4, or a separate NTP server, enter the IP address or DNS name of the CMM4 or NTP server on this tab. To force the AP/BHM to obtain time and date before the first (or next) 15-minute interval query of the NTP server, click Get Time via NTP.</li> </ul>

Attribute	Meaning
	The polling of the NTP servers is done in a sequential fashion, and the polling status of each server is displayed in the NTP Update Log section of the Time Configuration page. An entry of 0.0.0.0 in any of the NTP Server fields indicates an unused server configuration.
NTP Server (s) in Use	Lists the IP addresses of servers used for NTP retrieval.
Time Zone	The Time Zone option may be used to offset the received NTP time to match the operator's local time zone. When set on the AP/BHM, the offset is set for the entire sector SMs (or BHS) are notified of the current Time Zone upon initial registration). If a Time Zone change is applied, the SMs (or BHS) is notified of the change in a best effort fashion, meaning some SMs//BHSs may not pick up the change until the next reregistration. Time Zone changes are noted in the Event Log of the AP/BHM and SM/BHS.
System Time	The current time used by the system.
Last NTP Time Update	The last time that the system time was set via NTP.
Time	This field may be used to manually set the system time of the radio.
Date	This field may be used to manually set the system date of the radio.
NTP Update Log	This field shows NTP clock update log. It includes NTP clock update Date and Time stamp along with server name.

# **Configuring synchronization**

Applicable	PMP:	þ	AP	PTP:	þ	BHM
products						

# Sync Input

This section describes synchronization options for PMP and PTP configuration.

#### Figure 29: Sync Setting configuration

Sync Setting	
Sync input :	AutoSync
Free Run Before GPS Sync :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>
Device Type :	<ul> <li>Standard</li> <li>Remote</li> </ul>
Verify GPS Message Checksum :	Enabled Disabled
Sync Aux Port Config :	Sync Input •
Aux Port Power to UGPS :	<ul> <li>Enabled</li> <li>Disabled</li> <li>Please Note:</li> <li>To enable GPS information on the "Sync Status" page, "UGPS Power" must be enabled here.</li> <li>Enabling "UGPS Power" whilst also providing an alternative power source to a UGPS, is supported.</li> <li>Enabling the Aux Ethernet port will disrupt the Aux Power to UGPS</li> </ul>

The Sync Input parameter can be configured under Sync Setting tab of Configure > General page (see General configuration).

PMP/PTP 450i Series has following synchronization input options:

- AutoSync
- AutoSync + Free Run
- Generate Sync

### AutoSync

For 450i AP/BHM, 450b BHM and 450m AP, the AP/BHM automatically receives sync from one of the following sources:

- GPS Sync over Timing Port (UGPS, cnPulse, co-located AP GPS sync output, or "Remote" Device feed from a registered SM's GPS sync output)
- GPS Sync over Power Port (CMM4), CMM5, cnPulse module ODU Sync Port.

For 450 AP, the internal GPS is available in addition to the above sync sources. For a 450 BHM the only available sync source is the Timing Port, as GPS Sync Over Power Port is not supported.

Upon AP/BHM power on with the Free Run Before GPS Sync parameter set to disabled, the AP/BHM does not transmit until a valid synchronization pulse is received from one of the sources above. If there is a loss of GPS synchronization pulse after sync is initially established, within two seconds the AP/BHM automatically attempts to source GPS signaling from another source.

In case of PMP, when there are synchronization sources on both the timing port and the power port, the power port GPS source is chosen first.

If no valid GPS signal is received, the AP/BHM ceases transmission and SM/BHS registration is lost until a valid GPS signal is received again on the AP or BHM.



## Note

After a reboot of 450m AP, the sync acquisition takes a little longer than it had on 450i (anywhere from 40 seconds to 120 seconds difference).

When the Sync Input field is set to Autosync or Autosync + Free Run, other options become available to be set e.g. UGPS Power and other fields. This is true on APs and BHMs.

## AutoSync + Free Run

This mode operates similarly to mode "AutoSync", but if a previously received synchronization signal is lost and no GPS signaling alternative is achieved, the AP/BHM automatically changes to synchronization mode "Generate Sync - Free Run". While BHS/SM registration is maintained, in this mode there is no synchronization of APs/BHMs that can "hear" each other; the AP/BHM will only generate a sync signal for the local AP/BHM and its associated SMs/BHS. Once a valid GPS signal is obtained again, the AP/BHM automatically switches to receiving synchronization via the GPS source and SM/BHS registration is maintained.



Note

In mode AutoSync + Free Run with the Free Run Before GPS Sync parameter set to disabled, if a GPS signal is never achieved initially, the system will not switch to "Free Run" mode, and SMs/BHS will not register to the AP/BHM. A valid GPS signal must be present initially for the AP to switch into "Free Run" mode (and to begin self-generating a synchronization pulse).

Also, when an AP/BHM is operating in "Free Run" mode, over a short time it will no longer be synchronized with co-located or nearby APs/BHMs (within radio range). Due to this lack of transmit and receive synchronization across APs/BHMs or across systems, performance while in "Free Run" mode may be degraded until the APs/BHMs operating in "Free Run" mode regain a external GPS synchronization source. Careful attention is required to ensure that all systems are properly receiving an external GPS synchronization pulse, and please consider "Free Run" mode as an emergency option.

## **Generate Sync (Factory default)**

This option may be used when the AP/BHM is not receiving GPS synchronization pulses from either a CMM4/CMM5 or UGPS/cnPulse module, and there are no other APs/BHMs active within the link range. Using this option will not synchronize transmission of APs/BHMs that can "hear" each other; it will only generate a sync signal for the local AP/BHM and its associated SMs/BHS.



## Note

When an AP/BHM has its "Regional Code" set to "None", The radio will not provide valid Sync Pulse Information.

There is a RED warning that the radio will not transmit, but the user might expect to see a valid sync if the radio is connected to a working CMM4 or UGPS.

# Free Run Before GPS Sync

This option is available when the Sync Input parameter is configured for either AutoSync mode or AutoSync + Free Run mode. When Free Run Before GPS Sync is set to Enabled, if the radio does not detect a valid GPS synchronization pulse after booting up then it will operate in Generate Sync – Free Run mode until a valid source is detected. While the AP/BHM is in Generate Sync – Free Run mode SMs/BHS will be able to register, but there is no synchronization of APs/BHMs that can "hear" each other; the AP/BHM will only generate a sync signal for the local AP/BHM and its associated SMs/BHS. Once a valid synchronization source is found, the AP/BHM automatically switches to receiving synchronization from the source and SM/BHS registration is maintained. If Free Run Before GPS Sync is set to Disabled, the AP/BHM does not transmit and SMs/BHS will be unable to register until a valid GPS synchronization source is connected.

# **Device Type**

This parameter determines whether the device is configured as a Remote AP or BHM, receiving GPS sync from a co-located AP/BHM GPS sync output or Remote Device feed from a registered SM's or BHS's GPS sync output, or as a Standard AP or BHM. This parameter applies in AutoSync or AutoSync + Free Run modes only. Synchronization behavior is as follows:

**Standard**: The AutoSync mechanism will source GPS synchronization from the AP's Aux/Timing port, the AP's power port, or from the device on-board GPS module (if present).

Remote: The AutoSync mechanism will source GPS synchronization from the AP's Aux/Timing port or from the device on-board GPS module (if present). GPS synchronization pulses on the Power Port are ignored.

## Verify GPS Message Checksum

The Verify GPS Message Checksum parameter enables or disables validation of incoming GPS location messages from a UGPS or cnPulse module connected to the AP's Aux Port. When enabled the AP will discard messages found to have an incorrect checksum and will increment the Invalid Message Count display of the Sync Status tab of the Home GUI page accordingly.

# Sync Aux Port Config

The Sync Aux Port Config parameter controls how the Timing Port/UPGS port is used on the AP or BHM. This parameter replaces the Sync Out to Aux Port parameter from earlier software releases.

On the 450m AP, 450i AP/BHM, and 450 AP/BHM, this parameter takes effect when operating in AutoSync or AutoSync + Free Run modes. The available options are Sync Input or Sync Output, equivalent to Disabled and Enabled respectively for the Sync Out to Aux Port parameter:

- When configured for Sync Input, the AP will accept GPS sync in via the Timing Port/UGPS connector from a UGPS, cnPulse, co-located AP GPS sync output, or "Remote" Device feed from a registered SM's GPS sync output.
- When configured for Sync Output, the AP will output the GPS timing pulse on the Timing Port/UGPS connector. In this configuration the AP may serve as a GPS synchronization source for a co-located AP.

The 450b series radios are equipped with a 4-pin TRRS audio Timing Port/UGPS connector in place of the RJ45 or RJ12 connectors used on the 450m/450i/450 series. On the 450b BHM, the available Sync Aux Port Config options are Sync Input, Sync Output, and Alignment Tone:

- Sync Input and Sync Output behave the same as described above for the 450m, 450i and 450 platforms.
- The Alignment Tone option is available only on the 450b BHM. When this option is selected, the BHM will output a tone to both the left and right channels of a pair of stereo headphones plugged into the TRRS audio jack whenever a BHS session is active.



## Note

when Sync Aux Port Config is set to Sync Output, the 450b BHM will still generate an alignment tone but it will be audible only on the right stereo channel. When Sync Input is selected the 450b BHM will not generate the alignment tone on either stereo channel.
# **Aux Port Power to UGPS**

The 450 series APs are capable of supplying power to a connected UGPS or cnPulse module via the Aux/Timing Port. Enable the Aux Port Power to UGPS parameter to output power on the port.



# Note

The AP is able to receive GPS sync pulses and satellite data via the Aux Port regardless of whether this parameter is Enabled or Disabled. However, on the 450m AP and 450i AP/BHM, the satellite data is displayed on the Sync Status page only when the Aux Port power is enabled.



#### Caution

When a UGPS module is used to provide GPS sync to two 450m or 450i APs simultaneously, it is recommended to install a separate power supply for the UGPS to prevent the possibility of sync interruption upon reboot of the APs.

# **Configuring security**

Perform this task to configure the 450 Platform system in accordance with the network operator's security policy. Choose from the following procedures:

- Managing module access by password to configure the unit access password and access level
- See Radio Recovery. to ensure that APs are properly secured from external networks
- Encrypting radio transmissions to configure the unit to operate with AES wireless link security
- Requiring SM Authentication to set up the AP to require SMs to authenticate via the AP, WM, or RADIUS server
- Filtering protocols and ports to filter (block) specified protocols and ports from leaving the system
- Encrypting downlink broadcasts to encrypt downlink broadcast transmissions
- Isolating SMs to prevent SMs in the same sector from directly communicating with each other
- Filtering management through Ethernet to prevent management access to the SM via the radio's Ethernet port
- Allowing management only from specified IP addresses to only allow radio management interface access from specified IP addresses
- Restricting radio Telnet access over the RF interface to restrict Telnet access to the AP
- Configuring SNMP Access
- Configuring Security

# Managing module access by password

Applicable products	PMP:	þ	AP	þ	SM	PTP:	þ	ВНМ	þ	BMS
------------------------	------	---	----	---	----	------	---	-----	---	-----

See Managing module access by password in Planning and installation Guide.

### Adding a User for Access to a module

The Account > Add User page allows to create a new user for accessing 450 Platform Family - AP/SM/BHM/BHS. The Add User page is explained in below table.

Table 30: Add User page of account page - AP/ SM/BH

Add User	E
User Name :	
Level :	INSTALLER V
New Password :	
Confirm Password :	
User Mode :	read-only
l	Add

### Account Status

Attribute	Meaning
User Name	User Account name.
Level	Select appropriate level for new account. It can be INSTALLER, ADMINISTRATOR or TECHNICIAN. See Managing module Access by passwords in Planning and Installation Guide.
New Password	Assign the password for new user account
Confirm Password	This new password must be confirmed in the "Confirm Password" field.
User Mode	User Mode is used to create an account which are mainly used for viewing the configurations.
	The local and remote Read-Only user account can be created by "Admin", "Installer" or "Tech" logins. To create a Read-Only user, the "read-only" check box needs to be checked.



### Note

The Read-Only user cannot perform any service impacting operations like creating read-only accounts, editing and viewing read-only user accounts, changes in login page, read-only user login, Telnet access, SNMP, RADIUS and upgrade/downgrade.

### Deleting a User from Access to a module

The **Account > Delete User** page provides a drop-down list of configured users from which to select the user you want to delete. The Delete User page is explained in below table.

Table 31: Delete User page - 450 Platform Family - AP/ SM/BH

User:	admin 🔻	
	Delete	

Attribute	Meaning
User	Select a user from drop-down list which has to be deleted and click Delete button.
	Accounts that cannot be deleted are:
	<ul> <li>the current user's own account.</li> </ul>
	<ul> <li>the last remaining account of ADMINISTRATOR level.</li> </ul>

### **Changing a User Setting**

The **Account > Change User Setting** page allows to update password, mode update and general status permission for a user.

From the factory default state, configure passwords for both the root and admin account at the ADMINISTRATOR permission level, using Update Password tab of Change Users Setting page.

The Change User Setting page is explained in below table.

### Table 32: Change User Setting page - 450 Platform Family AP/ SM/BH

update Password	
User :	admin 🔻
New Password :	
Confirm Password :	
	Change Password
Update Mode	
User:	test 🔻
User Mode :	read-only
and a state of the state of the	Change Mode
General Status Permission	
General Status Page Viewable to Guest Users :	Enabled
	Lisabled
	Unange Hermission

Attribute	Meaning								
Update Password tab	This tab provides a drop-down list of configured users from which a user is selected to change password.								
Update Mode tab	This tab facilitates to convert a configured user to a Read-Only user.								
General Status Permission tab	This tab enables and disables visibility of General Status Page for all Guest users. To display of Radio data on SMs/BHS main Login page for Guest login, it can be enabled or disabled in Security tab of Configuration page. Figure 30: Evaluation Configuration parameter of Security tab for PMP AP Evaluation Configuration SM Display of AP Evaluation Data : Obsable Display Enable Display								
	Figure 31: BHM Evaluation Configuration parameter of Security tab for PTP         BHM Evaluation Configuration         BHS Display of BHM Evaluation Data :         © Disable Display         @ Enable Display								

### **Users account**

The Account > Users page allows to view all configured users account for accessing the module.

The Users page is explained in below table.

Table 33: User page -450 Platform Family AP/SM/BH

	Users		
	Username	Permission	Mode
	admin	ADMINISTRATOR	Read-Write
	root	ADMINISTRATOR	Read-Write
l	ins	INSTALLER	Read-Write

Attribute	Meaning
Username	User access account name
Permission	Permission of configured user - INSTALLER, ADMINISTRATOR or TECHNICIAN
Mode	This field indicate access mode of user - Read-Write or Read-Only.

### **Overriding Forgotten IP Addresses or Passwords on AP and SM**

See Radio Recovery.

# Isolating from the internet – APs/BHMs

Applicable products	PMP:	þ	AP	PTP:	þ	ВНМ
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See Isolating AP/BHM from the Internet in Planning and Installation Guide.

# **Encrypting radio transmissions**

Applicable PMP: products	þ	AP	þ	SM	PTP:	þ	ВНМ	þ	BMS
-----------------------------	---	----	---	----	------	---	-----	---	-----

See Encryption radio transmission in Planning and Installation Guide.

# **Requiring SM Authentication**

Applicable products	PMP:	þ	AP	þ	SM
---------------------	------	---	----	---	----

Through the use of a shared AP key, or an external RADIUS (Remote Authentication Dial In User Service) server, it enhances network security by requiring SMs to authenticate when they register.

For descriptions of each of the configurable security parameters on the AP, see Configuring Security. For descriptions of each of the configurable security parameters on the SM.

Operators may use the AP's Authentication Mode field to select from among the following authentication modes:

- Disabled—the AP requires no SMs to authenticate (factory default setting).
- Authentication Server —the AP requires any SM that attempts registration to be authenticated in Wireless Manager before registration
- AP PreShared Key The AP acts as the authentication server to its SMs and will make use of a user-configurable pre-shared authentication key. The operator enters this key on both the AP and all SMs desired to register to that AP. There is also an option of leaving the AP and SMs at their default setting of using the "Default Key". Due to the nature of the authentication operation, if you want to set a specific authentication key, then you MUST configure the key on all of the SMs and reboot them BEFORE enabling the key and option on the AP. Otherwise, if you configure the AP first, none of the SMs is able to register.
- RADIUS AAA When RADIUS AAA is selected, up to 3 Authentication Server (RADIUS Server) IP addresses and Shared Secrets can be configured. The IP address(s) configured here must match the IP address(s) of the RADIUS server(s). The shared secret(s) configured here must match the shared secret(s) configured in the RADIUS server(s). Servers 2 and 3 are meant for backup and reliability, not for splitting the database. If Server 1 doesn't respond, Server 2 is tried, and then server 3. If Server 1 rejects authentication, the SM is denied entry to the network, and does not progress trying the other servers.

For more information on configuring the PMP 450 Platform network to utilize a RADIUS server, see Configuring a RADIUS server.

# Filtering protocols and ports

Applicable products	PMP:	þ	AP	þ	SM	PTP:	þ	ВНМ	þ	BMS

The filtering protocols and ports allows to configure filters for specified protocols and ports from leaving the AP/SM/BHM/BHS and entering the network. See Filtering protocols ans ports in Planning and Installation Guide.

### Filters page of 450 Platform Family AP/BHM

The Filters page of 450 Platform Family - AP/BHM is explained in below table.

#### Table 34: AP/BHM Filters attributes

Packet Filter Configuration	PPPoE All PV4 BMB (Network Neighborhood) SMMP Bootp Client Bootp Server User Defined Port 1 (See Below) User Defined Port 2 (See Below) User Defined Port 3 (See Below) All other Pv4 All other Pv4 SMB (Network Neighborhood) SMMP Bootp Client Bootp Server (Pv0 Multicast
	Bootp Server Pro Multicaet All other Pv6 SPDU All others
Filter Directors :	Downstream
Fiber Interface :	G Main Ethernet

Port#1:	(Decimal Value)
TCP:	<ul> <li>Enabled</li> <li>Disabled</li> </ul>
LOP	<ul> <li>Enabled</li> <li>Desabled</li> </ul>
Port #2	a (Decimal Value)
TOP:	Enabled Disabled
UDP	<ul> <li>Enabled</li> <li>Disabled</li> </ul>
Port #3 :	0 (Decimal Value)
TOP:	Enabled     Disubled
UDP:	<ul> <li>Enabled</li> <li>Disabled</li> </ul>

AP Specially Filters	
RF Teinet Accase :	Enabled Disabled
PPPoE PADI Downlink Forwarding :	Enabled Disabled
MAC Address Fillering	Second
Filter Control	MAC Address Fitering Enabled     MAC Address Fitering Disabled
File Defect Actor	Allow all
Bouroe MAC Address or OUI	- deny - AccAldedy   Debde

Attribute	Meaning
Packet Filter Types	For any box selected, the Protocol and Port Filtering feature blocks the associated protocol type.
	To filter packets in any of the user-defined ports, must do all of the following:

Attribute	Meaning	
	Check the box for User Defined Port n (See Below) in the Packet Filter Types section of this tab.	
	In the User Defined Port Filtering Configuration section of this tab:	
	<ul> <li>provide a port number at Port #n.</li> </ul>	
	<ul> <li>enable TCP and/or UDP by clicking the associated radio button</li> </ul>	
Filter Direction	Operators may choose to filter upstream (uplink) RF packets or downstream (downlink) RF packets.	
User Defined Port Filtering Configuration	You can specify ports for which to block subscriber access, regardless of whether NAT is enabled.	
RF Telnet Access	RF Telnet Access restricts Telnet access to the AP/BHM from a device situated below a network SM/BHS (downstream from the AP/BHM). This is a security enhancement to restrict RF-interface sourced AP access specifically to the LAN1 IP address and LAN2 IP address (Radio Private Address, typically 192.168.101.[LUID]). This restriction disallows unauthorized users from running Telnet commands on the AP/BHM that can change AP/BHM configuration or modifying network-critical components such as routing and ARP tables.	
PPPoE PADI Downlink Forwarding	<ul> <li>Enabled: the AP/BHM allows downstream and upstream transmission of PPPoE PADI packets. By default, PPPoE PADI Downlink Forwarding is set to Enabled.</li> <li>Disabled: the AP/BHM disallows PPPoE PADI packets from entering the Ethernet interface and exiting the RF interface (downstream to the SM/BHS). PPPoE PADI packets are still allowed to enter the AP's RF interface and exit the AP's/BHM's Ethernet interface (upstream).</li> </ul>	
Filter Control	Provision to Enable/Disable MAC Address Filtering.	
Filter Default Action	If the Filter Default Action is set to <b>Allow all</b> , any frame whose source MAC address or OUI is:	
	<ul> <li>in the MAC address filters table and Action is set to Deny, will be blocked from passing through.</li> </ul>	
	<ul> <li>in the MAC address filters table and Action is set to Allow, will be allowed to pass through.</li> </ul>	
	<ul> <li>not in the MAC address filters table will be allowed to pass through.</li> </ul>	
	If the Filter Default Action is set to <b>Deny all</b> , any frame whose source MAC Address or OUI is:	
	<ul> <li>in the MAC address filters table and Action is set to Deny, will be blocked from passing through.</li> </ul>	
	<ul> <li>in the MAC address filters table and Action is set to Allow, will be allowed to pass through.</li> </ul>	
	• not in the MAC address filters table will be blocked from passing through.	

Attribute	Meaning
Source MAC Address or OUI	Indicates the unique MAC address or the manufacturer's OUI. You can add the MAC address or OUI in any of the following formats:
	• aa:bb:cc or aa-bb-cc or aabbcc
	aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff or aabbccddeeff

# Protocol filtering page of SM/BHS

The Protocol Filtering page of SM/BHS is explained in below table.

Table 35: SM/BHS Protocol Filtering attributes

Packet Filter Configuration	
Packet Filter Types :	PPPoE     All IPv4     SMB (Network Neighborhood)     SNMP     Bootp Client     Bootp Sarver     IPv4 Muticast     User Defined Port 1 (See Below)     User Defined Port 3 (See Below)     User Defined Port 3 (See Below)     All other IPv4     All IPv6     SMB (Network Neighborhood)     SMMP     Bootp Client     Bootp Sarver     IPv6 Muticast     All other IPv6     All ARP     BPDU     All others
Filter Direction :	Downstream
Filter Interface :	Main Ethernet

User Defined Part Filtering Configura	ban)	
Port#1	0 (Decimal Value)	
TOP:	Cisabled Disabled	
UDP :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	
Port #2	9 (Decimal Value)	
TCP:	Crubled Disabled	
UDP:	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	
Port#3:	(Decimal Value)	
TCP:	Enabled Disabled	
UDP:	Enabled     Disabled	_
AP Specially Filters	CONTRACTOR AND A CONTRACT	- 3
RF Telnot Access :	Enabled     Disabled	
PPPoE PADI Downlink Forwarding	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	

Attribute	Meaning
Packet Filter Configuration tab	See Filters page of 450 Platform Family AP/BHM
User Defined Port Filtering Configuration tab	See Filters page of 450 Platform Family AP/BHM

### **Port configuration**

450 Platform Family ODUs support access to various communication protocols and only the ports required for these protocols are available for access by external entities. Operators may change the port numbers for these protocols via the radio GUI or SNMP.

The Port Configuration page of the AP/SM/BHM/BHS is explained in below table.

Table 36: Port Configuration attributes - AP/SM/BHM/BMS

Port Configuration		
FTP Port :	21	Default port number is 21
HTTP Port :	80	Default port number is 80
HTTPs Port :	443	Default port number is 443
Radius Port :	1812	Default port number is 1812
Radius Accounting Port :	1813	Default port number is 1813
SNMP Port :	161	Default port number is 161
SNMP Trap Port :	162	Default port number is 162
Syslog Server Port :	514	Default port number is 514

Attribute	Meaning
FTP Port	The listen port on the device used for FTP communication.
HTTP Port	The listen port on the device used for HTTP communication.
HTTPS Port	The listen port on the device used for HTTPS communication
Radius Port	The destination port used by the device for RADIUS communication.
Radius Accounting Port	The destination port used by the device for RADIUS accounting communication.
SNMP Port	The listen port on the device used for SNMP communication.
SNMP Trap Port	The destination port used by the device to which SNMP traps are sent.
Syslog Server Port	The destination port used by the device to which Syslog messaging is sent.

# **Encrypting downlink broadcasts**

See Encryption downlink broadcast in Installation and Planning Guide.

# **Isolating SMs**

See Isolating SMs in Installation and Planning Guide.

# Filtering management through Ethernet

See Filtering management through Ethernet in Installation and Planning Guide.

# Allowing management only from specified IP addresses

See Allowing management only from specified IP address in Installation and Planning Guide.

# Restricting radio Telnet access over the RF interface

RF Telnet Access restricts Telnet access to the AP from a device situated below a network SM (downstream from the AP). This is a security enhancement to restrict RF-interface sourced AP access specifically to the LAN1 IP address and LAN2 IP address (Radio Private Address, typically 192.168.101. [LUID]). This restriction disallows unauthorized users from running Telnet commands on the AP that can change AP configuration or modifying network-critical components such as routing and ARP tables.

The RF Telnet Access may be configured via the AP GUI or via SNMP commands, and RF Telnet Access is set to "Enabled" by default. Once RF Telnet Access is set to "Disabled", if there is a Telnet session attempt to the AP originating from a device situated below the SM (or any downstream device), the attempt is dropped. This also includes Telnet session attempts originated from the SM's management interface (if a user has initiated a Telnet session to a SM and attempts to Telnet from the SM to the AP). In addition, if there are any active Telnet connections to the AP originating from a device situated below the SM (or any downstream device), the connection is dropped. This behavior must be considered if system administrators use Telnet downstream from an AP (from a registered SM) to modify system parameters.

Setting RF Telnet Access to "Disabled" does not affect devices situated above the AP from accessing the AP via Telnet, including servers running the CNUT (Canopy Network Updater tool) application. Also, setting RF Telnet Access to "Disabled" does not affect any Telnet access into upstream devices (situated above or adjacent to the AP) through the AP (see RF Telnet Access Restrictions (orange) and Flow through (green)).

The figure below depicts a user attempting two telnet sessions. One is targeted for the AP (orange) and one is targeted for the network upstream from the AP (green). If RF Telnet Access is set to "Disabled" (factory default setting), the Telnet attempt from the user to the AP is blocked, but the attempt from the user to Network is allowed to pass through the Cambium network.

Figure 32: RF Telnet Access Restrictions (orange) and Flow through (green)



### Key Security Considerations when using the RF Telnet Access Feature

To ensure that the network is fully protected from unauthorized AP Telnet sessions, the following topics must be considered:

### **Securing AP Clusters**

When working with a cluster of AP units, to eliminate potential security holes allowing Telnet access, ensure that the RF Telnet Access parameter is set to "Disabled" for every AP in the cluster. In addition, since users situated below the AP are able to pass Telnet sessions up through the SM and AP to the upstream network (while AP RF Telnet Access is set to "Disabled"), ensure that all CMM4 or other networking equipment is secured with strong passwords. Otherwise, users may Telnet to the CMM4 or other networking equipment, and subsequently access network APs (see RF Telnet Access Restriction (orange) and Potential Security Hole (green)) via their Ethernet interfaces (since RF Telnet Access only prevents Telnet sessions originating from the AP's wireless interface).

(°) AP\_B (°) AP\_A (°) AP\_A (°) SM\_A User

Figure 33: RF Telnet Access Restriction (orange) and Potential Security Hole (green)

As a common practice, AP administrator usernames and passwords must be secured with strong, nondefault passwords.

### **Restricting AP RF Telnet Access**

AP Telnet access via the RF interface may be configured in two ways - the AP GUI and SNMP.

### **Controlling RF Telnet Access via the AP GUI**

To restrict all Telnet access to the AP via the RF interface from downstream devices, follow these instructions using the AP GUI:

#### Procedure 12 Restricting RF Telnet access:

1	Log into the AP GUI using administrator credentials
2	On the AP GUI, navigate to Configuration > Protocol Filtering
3	Under GUI heading "Telnet Access over RF Interface", set RF Telnet Access to Disabled

	AP Specialty Filters			
	RF Telnet Access :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>		
	PPPoE PADI Downlink Forwarding :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>		
4	Click the Save button			
5	Once the Save button is clicked, all RF Telnet Access to the AP from devices situated below the AP is blocked.			



## Note

The factory default setting for RF Telnet Access is disabled and PPPoE PADI Downlink Forwarding is enabled.

# **Configuring SNMP Access**

The SNMPv3 interface provides a more secure method to perform SNMP operations. This standard provides services for authentication, data integrity and message encryption over SNMP. Refer to Planning of SNMPv3 operation in Planning and Installation Guide.



Note

The factory default setting for SNMP is SNMPv2c Only.

#### Procedure 13 Configuring SNMPv3:

- 1. Log into the AP GUI using administrator credentials
- 2. On the AP/SM GUI, navigate to Configuration > Security page
- 3. Under GUI heading Security Mode, set SNMP to SNMPv3 Only

Security Mode	
Web Access :	HTTP and HTTPs v
SNMP :	SNMPv2c and SNMPv3 w
Teinet :	Disable SNMP SNMPV2c Only ENMPv3 Only
FTP	SPREAD STATES STATES TO A
in .	O Disabled
TETP	Enabled
PRINCE	Obsabled
NTP server :	Enabled
WIT STATES	O Disabled
SSH Server :	Enabled
Contract Contract	Disabled
	Deady Safr Keye
Cross-site Request Forgery(CSRF) Protection :	Disable v

- 4. Click the Save Changes button
- 5. Go to **Configuration >SNMP** Page

- Under GUI heading SNMPv3 setting, set Engine ID, SNMPv3 Security Level, SNMPv3 Authentication Protocol, SNMPv3 Privacy Protocol, SNMPv3 Read-Only User, SNMPv3 Read/Write User, SNMPv3 Trap Configuration parameters:
- 7. Under GUI heading **SNMPv3 setting**, set Engine ID, SNMPv3 Security Level, SNMPv3 Authentication Protocol, SNMPv3 Privacy Protocol, SNMPv3 Read-Only User, SNMPv3 Read/Write User, SNMPv3 Trap Configuration parameters:

SNMPv3 Settings						
Engine ID :	ine ID : 800000a1030a003e47d1bc Use Default Engine ID					
SNMPv3 Security Level :	noAuth,noPriv •					
SNMPv3 Authentication Protocol :	md5 •					
SNMPv3 Privacy Protocol :	cbc-des ·					
SNMPv3 Read-Only User :	Username Canopyro Authorization Key Privacy Key					
SNMPv3 Read/Write User :	Enable R/W User     Disable R/W User     Username Canopy     Authorization Key     Privacy Key					
SNMPv3 Trap Configuration :	Disabled •					

#### Engine ID:

Each radio (AP/SM/BHM/BHS) has a distinct SNMP authoritative engine identified by a unique Engine ID. While the Engine ID is configurable to the operator it is expected that the operator follows the guidelines of the SNMPEngineID defined in the SNMP-FRAMEWORK-MIB (RFC 3411). The default Engine ID is the MAC address of the device.

#### SNMPv3 security level

The authentication allows authentication of SNMPv3 user and privacy allows for encryption of SNMPv3 message.

#### SNMPv3 Security Protocol

450 Platform family supports MD5, SHA-1 and SHA-256 authentications.

#### SHA-1

System release 20.0 introduces SHA-1 (Secure Hash Algorithm 1), is a cryptographic hash function which takes an input and produces a 160-bit (20-byte) hash value known as a message digest.

#### SHA-256

System release 20.0 introduces SHA-256 (Secure Hash Algorithm 2) is a cryptographic hash functions designed by the United States National Security Agency (NSA). SHA-2 includes significant changes from its predecessor, SHA-1. The SHA-256 hash function is implemented in some widely used security applications and protocols, including TLS and SSL, PGP, SSH, S/MIME, and IPsec.

To enable this feature:

#### Go to Configuration > SNMP page > SNMPv3 Settings.

Engine ID -	000000w1010a003w45bx82	Use Default Dright D
SMMPs3 Security Level .	autopro +	
SNMPv5 Authentication Protocol	kiter, 214 + 1	
SNMPx3 Privacy Protocol :	NO6	
PUTCH DEPARTMENT PROPERTY	anno 1	
12NMPv2 Reast-Only Oter :	Authorization Key	
CONTROL OF CONTROL OF CONTROL OF	Privacy Key	

#### SNMPv3 Privacy Protocol

450 Platform family supports CBC-DES and CFB-AES privacy protocols

System release 20.0 introduces AES encryption (Advanced Encryption Standard), is a symmetric block cipher chosen by the U.S. government to protect classified information and is implemented in software and hardware throughout the world to encrypt sensitive data. The algorithm described by AES is a symmetric-key algorithm, meaning the same key is used for both encrypting and decrypting the data.

To enable this feature:

#### Go to Configuration > SNMP page > SNMPv3 Settings.

SNMPv3 Settings		the second se
Engine ID	800000e1038e003e458e8J	Line Defined Brighter (D
SNMPv3 Security Level	Alfum +	
SMMPV3 Authentication Photocol :	5864-258 +	
SNMPv3 Privacy Protocol :	CPB-AER +	
the service of the se	CBC-DES sengtint	
SNMPv3 Reast-Only User :	Antor Presentar Key: Services	
	Privacy Key	

#### SNMPv3 Read-Only and Read/Write User

The user can be defined by configurable attributes. The attributes and default values are:

#### Read-only user

- Authentication Password = authCanopyro
- Privacy Password = privacyCanopyro
- sername = Canopyro

#### Read-write user (by default read-write user is disabled)

Privacy Password = privacyCanopy

Authentication Password = authCanopy

Username = Canopy

#### SNMPv3 Trap Configuration

The traps may be sent from radios in SNMPv3 format based on parameter settings. It can be configured for Disabled, Enabled for Read-Only User, Enable for Read/Write User.

# **Configuring Security**

Applicable products	PMP:		AP		SM	PTP:	ً	BHM	Ø	BMS	
---------------------	------	--	----	--	----	------	---	-----	---	-----	--

# Security Page 450 Platform Family AP

The security page of AP is explained in below table.

Table 37: Security attributes -450 Platform Family AP

Authentication Server Settings					
Authentication Mode :	Disabled 🔻				
Authentication Server DNS Usage :	Append DNS Domain Name				
	Disable DNS Domain Name				
Authentication Server 1 :	Shared Secret				
	0.0.0				
Authentication Server 2	Shared Secret				
	0.0.0.0				
Authentication Server 2 :	Shared Secret				
Autrentication Server 5.	0.0.0.0				
Authentication Server 4 (BAM ONLY) :	0.0.0				
Authentication Server 5 (BAM ONLY) :	0.0.0				
Radius Port :	1812 Default port number is 1812				
Authentication Key 128-bit :	(Using All 0xFF's Key)				
Select Key 128-bit :	Use Key above				
	Use Default Key				
Disable AES-128	AES-128 Encryption Disabled				
Disable ALG-120.	AES-128 Encryption Available				
Authentication Key 256-bit :					
	(Using All 0xFF's Key)				
Select Key 256-bit :	Use Key above				
	Use Default Key				
Dynamic Authorization Extensions for	Enable CoA and Disconnect Message				
RADIUS :	Disable CoA and Disconnect Message				
Puppes Authentication for ICC SMc -	© Enabled				
Sypass Automication for 100 SMS.	Oisabled				

Airlink Security	
Encryption Setting :	None 🔻
AP Evaluation Configuration	
SM Display of AP Evaluation Data :	<ul> <li>Disable Display</li> <li>Enable Display</li> </ul>
Session Timeout	
Web, Telnet, FTP Session Timeout :	600 Seconds

IP Access Filtering	
IP Access Control	<ul> <li>IP Access Filtering Enabled - Only allow access from IP addresses specified below</li> <li>IP Access Filtering Disabled - Allow access from all IP addresses</li> </ul>
Allowed Source IP 1	0.0.0 / 32 Natwork Mask (sat to 32 to disable)
Allowed Source IP 2	0.0.0.0 / 32 Network Mask (set to 32 to disable)
Allowed Source IP 3	6 0 0 0 / 32 Network Mask (set to 32 to disable)
Security Mode	
Web Access	MTTP Only
SNWF-	Sharve only
Teinet	Disabled
57D	Enabled
FIP:	O Disabled
TETP	Enabled
	Disabled
NTP server	Enabled     Disabled
	Enabled
SSH Server	Disabled
Import PKOS#12 File	
Choose Certaincate rise	
Pile Choose File No Se chosen	
Password	
	Import PKCS#12 File
Certificate	
Lang Contificate not area and	

Site Information		
Site Information Viewable to Guest Users	© Enabled # Disabled	
Site Name :	No Site Name	
Site Contact	No Ste Contact	
Site Location :	Hu Site Location	

Security Banner	ecurity Banner				
Enable Security Banner during Login :	© Enabled * Disabled				
Security Banner Notice	This is a sample of the text that can be put in this banner				
User must accept security banner before login	+ Enabled O Disabled				

Attribute	Meaning	
Authentication Mode	Operators may use this field to select from among the following authentication modes:	
	<b>Disabled:</b> Tthe AP requires no SMs to authenticate. (Factory default).	
	Authentication Server: The AP/BHM requires any SM/BHS that attempts registration to be authenticated in Wireless Manager before registration.	

Attribute	Meaning	
	AP PreShared Key: The AP/BHM acts as the authentication server to its SMs/BHS and will make use of a user-configurable pre-shared authentication key. The operator enters this key on both the AP/BHM and all SMs/BHS desired to register to that AP/BHM. There is also an option of leaving the AP/BHM and SMs/BHS at their default setting of using the "Default Key". Due to the nature of the authentication operation, if you want to set a specific authentication key, then you MUST configure the key on all of the SMs/BHS and reboot them BEFORE enabling the key and option on the AP/BHM. Otherwise, if you configure the AP/BHM first, none of the SMs/BHS is able to register.	
	RADIUS AAA- When RADIUS AAA is selected, up to 3 Authentication Server (RADIUS Server) IP addresses and Shared Secrets can be configured. The IP address (s) configured here must match the IP address(s) of the RADIUS server(s). The shared secret(s) configured here must match the shared secret(s) configured in the RADIUS server(s). Servers 2 and 3 are meant for backup and reliability, not for splitting the database. If Server 1 doesn't respond, Server 2 is tried, and then server 3. If Server 1 rejects authentication, the SM is denied entry to the network, and does not progress trying the other servers.	
Authentication Server DNS Usage	The management DNS domain name may be toggled such that the name of the authentication server only needs to be specified and the DNS domain name is automatically appended to that name.	
Authentication Server 1 to 5	Enter the IP address or server name of the authentication server (RADIUS or WM) and the Shared Secret configured in the authentication server. When Authentication Mode RADIUS AAA is selected, the default value of Shared Secret is "CanopySharedSecret". The Shared Secret may consist of up to 32 ASCII characters.	
Radius Port	This field allows the operator to configure a custom port for RADIUS server communication. The default value is 1812.	
Authentication Key 128-bit	This authentication key is a 32-character hexadecimal string used when Authentication Mode is set to AP PreShared Key. By default, this key is set to OxFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF	
Select Key 128-	This option allows operators to choose which authentication key is used:	
bit	Use Key above means that the key specified in Authentication Key is used for authentication	
	Use Default Key means that a default key (based off the SM's MAC address) is used for authentication	
Disable AES 128-bit	This option allows to disable the AES-128 encryption. When AES-128 Encryption is disabled, it prevents the use of AES-128 when encryption is enabled. Since changes to other attributes (e.g. PreSharedKey authentication settings) could cause a need for 128-bit Auth and AES-128 upon next registration, Disable AES 128-bit parameter is prevented from being changed on the "Security" webpage while the "Reboot Required" warning is present at the top of the Web GUI pages. The recommendation is to complete other changes first and to ensure that all links at an AP are running AES-256 before disabling the use of AES-128 on all units (AP and SMs) in the sector.	

Attribute	Meaning	
	When saving and loading a configuration file, Disable AES 128 is saved and loaded as a normal attribute. It will not take effect until a reboot is triggered. Since enabling this attribute could have the effect of preventing a link coming up, care should be taken on networks that enable this attribute on only some units.	
	Select one of the following options to either disable or use AES-128 encryption.	
	AES-128 Encryption Disabled:	
	AES-128 Encryption Available	
Authentication Key 256-bit	This authentication key is a 64-character hexadecimal string used when Authentication Mode is set to AP PreShared Key. By default, this key is set to 0xFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF	
	FFFFFFFFF.	
	<b>Note:</b> The AES-256 parameters are visible only when the feature key is purchased.	
Select Key 256-	This option allows operators to choose which authentication key is used:	
bit	Use Key above means that the key specified in Authentication Key is used for authentication	
	Use Default Key means that a default key (based off of the SM's MAC address) is used for authentication	
	Note: The AES-256 parameters are visible only when the feature key is purchased.	
Dynamic Authorization Extensions for RADIUS	Enable CoA and Disconnect Message: Allows to control configuration parameters of SM using RADIUS CoA and Disconnect Message feature.	
	Disable CoA and Disconnect Message: Disables RADIUS CoA and Disconnect Message feature.	
	To enable CoA and Disconnect feature, the Authentication Mode should be set to RADIUS AAA.	
Bypass Authentication	<b>Enabled</b> : SM authentication is disabled when SM connects via ICC (Installation Color Code).	
for ICC SMs	<b>Disabled:</b> SM authentication is enabled.	
Encryption Setting	Specify the type of airlink security to apply to this AP. The encryption setting must match the encryption setting of the SMs.	
	None provides no encryption on the air link.	
	AES (Advanced Encryption Standard): An over-the-air link encryption option that uses the Rijndael algorithm and 128-bit keys to establish a higher level of security. AES products are certified as compliant with the Federal Information Processing Standards (FIPS 197) in the U.S.A.	
	Note: This parameter is applicable to BHM.	

Attribute	Meaning	
SM Display of AP Evaluation Data Or	Allows operators to suppress the display of data about this AP/BHM on the AP/BH Evaluation tab of the Tools page in all SMs/BHS that register. The factory default setting for SM Display of AP Evaluation Data or BHS Display of BHM Evaluation Da is enabled display.	
BHS Display of BHM Evaluation Data	PMP 450/450i Series - SM display of AP Evaluation Data parameter	
	AP Evaluation Configuration	
	PTP 450/450i Series - BHS display of BHM Evaluation Data parameter	
	BHM Evaluation Configuration BHS Display of BHM Evaluation Data : O Disable Display Enable Display	
Web, Telnet, FTP Session Timeout	Enter the expiry in seconds for remote management sessions via HTTP, telnet, or ftp access to the AP/BHM.	
IP Access Control	You can permit access to the AP/BHM from any IP address (IP Access Filtering Disabled) or limit it to access from only one, two, or three IP addresses that you specify (IP Access Filtering Enabled). If you select IP Access Filtering Enabled, then you must populate at least one of the three Allowed Source IP parameters or have no access permitted from any IP address	
Allowed Source IP 1 to 3	If you selected IP Access Filtering Enabled for the IP Access Control parameter, then you must populate at least one of the three Allowed Source IP parameters or have no access permitted to the AP from any IP address. You may populate as many as all three.	
	If you selected IP Access Filtering Disabled for the IP Access Control parameter, then no entries in this parameter are read, and access from all IP addresses is permitted.	
Web Access	The Radio supports secured and non-secured web access protocols. Select suitable web access from drop-down list:	
	<ul> <li>HTTP Only - provides non-secured web access. The radio to be accessed via http://<ip of="" radio="">.</ip></li> <li>HTTPS Only - provides a secured web access. The radio to be accessed via https://<ip of="" radio="">.</ip></li> <li>HTTP and HTTPS - If enabled, the radio can be accessed via both HTTP and HTTPS.</li> </ul>	
SNMP	This option allows to configure SNMP agent protocol version. It can be selected from drop-down list:	
	<ul> <li>Disable SNMP - To disable SNMP agent.</li> <li>SNMPv2c Only - Enables SNMP v2c protocol.</li> <li>SNMPv3 Only - Enables SNMP v3 protocol. It is a secured communication protocol.</li> </ul>	

Attribute	Meaning
	<ul> <li>SNMPv2c and SNMPv3 – It enables both the protocols.</li> </ul>
Telnet	This option allows to Enable and Disable Telnet access to the Radio.
FTP	This option allows to Enable and Disable FTP access to the Radio.
TFTP	This option allows to Enable and Disable TFTP access to the Radio.
NTP Server	This option allows to Enable and Disable NTP server access to the Radio.
SSH Server	This option allows to Enable and Diable SSH server access to the Radio. Once user is logged in via SSH, the Command Line Interface (CLI) which is the same as Telnet will be presented to user.
Cross-site	<b>Default</b> : CSRF token is not added to HTTP POST requests.
Request Forgery (CSRF)	<b>Disable:</b> CSRF token is not added to HTTP POST requests.
Protection	Enable: CSRF token is added to HTTP POST requests.
Upload Certificate File	Users can import a certificate in PKCS12 format which contains a private key and certificate signed CA. Private key can be password protected and a password field is also given to user while importing.
Certificate	After successful import, the certificate information will be displayed
Site Information viewable to Guest Users	This option allows to Enable or Disable displaying site information with Guest users.
Site Name	Specify a string to associate with the physical module.
Site Contact	Enter contact information for the module administrator.
Site Location	Enter information about the physical location of the module.
Enable Security	<b>Enable:</b> The Security Banner Notice will be displayed before login.
Banner during Login	Disable: The Security Banner Notice will not be displayed before login.
Security Banner Notice	User can enter ASCII (0-9a-zA-Z newline, line-feed are allowed) text up-to 1300 characters.
User must accept security	<b>Enable:</b> Login area (username and password) will be disabled unless user accepts the security banner.
banner before login	<b>Disable:</b> User can't login to radio without accepting security banner.

# TLS 1.2 and 1.3

Software release 20.0 supports web server using TLS 1.2 and TLS 1.3 for HTTPS connections. Protocol version will be selected after handshake.



# Note

A cnMaestro feature called **cnMaestro X feature Assists** is introduced in the 4th quarter of 2022. It identifies sectors with potential security concerns and encourages operators to disable HTTP (using HTTPS only) and telnet access, among other parameters. This approach works well for PMP System Release 20.0 and later versions. However, if an operator downgrades their radios to versions older than System Release 20.0, they risk losing management access to those radios. This is because not all browsers support the TLS version 1.0 used by System Release 16.x software by default. Cambium advises operators who need to downgrade their radios to enable HTTP on those radios via the **Configuration -** > **Security** page before downgrading. If an operator mistakenly downgrades without reenabling HTTP access and loses management access, there are two possible solutions. One option is to configure Mozilla Firefox with security.tls.version.min set to 1. Another option is to raise a support ticket with Cambium for assistance.

### **User Certificate Import**

This feature allows users to import their own certificate to be used by HTTPS server. This option can be found under **Configuration > Security**.

Users can import a certificate in PKCS12 format which contains a private key and certificate signed CA.Private key can be password protected and a password field is also given to user while importing.

Import PKCS#12 File		
Upload Certificate File		
File: Choose File No file chosen		
Password :	Import PKCS#12 File	
	Truckers ( operation of the fi	
Certificate	handle over Charger & OUL DWD O - CAMPULAL CT-YAA	Call
emailAddress=supportigcamolumn Issued by: Smruti	Inworks.com, CN=Emruti, OU=PMP, O=CAMBIUM, S1=KA, C	U=IN
Valid from 20-01-2020 to 17-01-20	30	
Signature Algorithm: sha256WithP Delete	SAEncryption	

#### After successful import the certificate information will be displayed as follows.

Certificate	
emailAddress=support@cambiumnetworks.com,CN=smruti,OU=PMP,O=CAMBIUM,ST=KA,C=IN Issued by: PMP 450 BLR Valid from 20-01-2020 to 17-01-2030 Signature Algorithm: sha256WithRSAEncryption Deime	

### Security page - 450 Platform Family BHM

The security page of AP/BHM is explained in below table.

### Table 38: Security attributes -450 Platform Family BHM

Authentication Mode			
Authentication Mode	<ul> <li>Authen</li> <li>Authen</li> </ul>	tication tication	Required Disabled
Authentication Key 128-bit	]		(Using All 0xFF's Key)
Airlink Security			
24 Hour Encryption Refresh :	Enable Disable		
Encryption Setting	None *		
BHM Evaluation Configuration			
BHS Display of BHM Evaluation Data	<ul> <li>Disable</li> <li>Enable</li> </ul>	Display Display	1.
Session Timeout	-		
Web, Telnet, FTP Session Timeout	600	Seco	nds
ID Arcess Filtering			
IP Access Control	IP Access F	itering Ena	bled - Only allow access from IP addresses specified below
Allowed Source IP 1	IP Access F	itering Dis	abled - Allow access from all IP addresses
Allowed Source IP 2	0000	1 32	Network Mask (set to 32 to disable)
Allowed Source IP 3	0000	1 32	Network Mask (set to 32 to disable)
Security Mode			
Web Access	HTTP Only	×	
SNMP :	SNMP/2c Only	~	
Telnot	Enabled		
ETD.	Enabled		
F DP	O Disabled		
TFTP :	Enabled		
NTP server	C Enabled		
SSH Server	Enabled     Disabled		
Import PKCS#12 File			
Import PKCS#12 File Upload Certificate File			
Import PKCS#12 File Upload Certificate File File Choose File No tile chosen			
Import PKCS#12 File Upload Certificate File File: Choose File No file chosen			

Site Information	
Site Information Viewable to Guest Users :	Enabled Disabled
Site Name :	246 BHTM 4.9/5.9 MIMO PTP450i
Site Contact :	No Site Contact
Site Location :	Canopy FN Screen Room

Security Banner		E
Enable Security Banner during Login :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	
Security Banner Notice :		11
User must accept security banner before login :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	

Attribute	Meaning
Authentication Mode	Operators may use this field to select from among the following authentication modes:
	Authentication Required: the BHS requires to be authenticated.
	Authentication Disabled: the BHM requires no BHS to authenticate. (Factory default).
Authentication Key 128-bit	Refer Security Page 450 Platform Family APfor parameter details
24 Hour Encryption Refresh	Operators may use this field to select from among the following options:
	Enabled: Allows BHS re-registration every 24 hours.
	Disabled: Disables 24-hour encryption refresh.
	This parameter is disabled by default.

Attribute	Meaning
Encryption Setting	Refer Security Page 450 Platform Family AP for parameter details
BHS Display of BHM Evaluation Data	
Web, Telnet, FTP Session Timeout	
IP Access Control	
Allowed Source IP 1 to 3	
Web Access	
SNMP	
Telnet	
FTP	
TFTP	
NTP Server	
Site Information viewable to Guest Users	Refer Security Page 450 Platform Family APfor parameter details
Site Name	
Site Contact	
Site Location	
Enable Security Banner during Login	
Security Banner Notice	
User must accept security banner before login	

# Security page - 450 Platform Family SM

The security page of 450 Platform Family SM is explained in below table.

Table 39: Security attributes -450 Platform Family SM

Authentication Key Settings		
Authentication Key 128-bit :	(Using All 0xFF's Key)	
Select Key 128-bit :	Use Key above Output the set of th	
Disable AES-128 :	<ul> <li>AES-128 Encryption Disabled</li> <li>AES-128 Encryption Available</li> </ul>	
Authentication Key 256-bit :	(Using All 0xFF's Key)	
Select Key 256-bit :	OUse Key above OUse Default Key	

AAA Authentication Settings	
Enforce Authentication :	Disable 💌
Phase 1 :	eapttls 🔻
Phase 2 :	MSCHAPv2 🔻
Identity/Realm :	<ul> <li>Enable Realm</li> <li>Disable Realm</li> <li>Identity anonymous</li> <li>@ Realm canopy.net</li> </ul>
Username :	0a-00-3e-bb-40-d2 Use Default Username
Password :	••••••
Confirm Password :	

RADIUS Certificate Settings	
Upload Certificate File	
File: Browse No file selected.	
Import Certificate Use Default Certificates This will delete all current certificates	

### Certificate 1

C =US S =Illinois O =Motorola Solutions, Inc. OU =Canopy Wireless Broadband CN =Canopy AAA Server Demo CA E =technical-support@canopywireless.com Valid From: 01/01/2001 00:00:00 Valid To: 12/31/2049 23:59:59 Delete

#### Certificate 2

C =US
S =Illinois
O =Motorola, Inc.
OU =Canopy Wireless Broadband
CN =PMP320 Demo CA
Valid From: 07/01/2009 06:00:00
Valid To: 12/31/2049 23:59:59
Delete

Airlink Security Encryption Setting:

AES T

600

#### Session Timeout

Web, Telnet, FTP Session Timeout :

Seconds

Ethernet Access :	Enabled O Disabled		
IP Access Filtering			
IP Access Control :	IP Access Filtering Enabled - Only allow access from IP addresses specified below IP Access Filtering Disabled - Allow access from all IP addresses		
Allowed Source IP 1	0.0.0	1.32	Network Mask (set to 32 to disable)
Allowed Source IP 2	0.000	1 22	Network Mask (set to 32 to disable)
Allowed Source IP 3 :	0.0.0.0	1 92	Network Mask (set to 32 to disable)
Security Mode			
Web Access	HTTP Only	~	
SNMP	SNMPv2c Only	~	
Teinet	Enabled Obisabled		
FTP _	Enabled Disabled		
TETP	Enabled Disabled		
SSH Server	Enabled	(Kevs.)	
Cross-site Request Forgery(CSRF) Protection	Default V		
Import PKCS#12 File			
Upload Certificate File			
File. Choose File. No file chosen			
Password :	Image By CO.	e10 E/e ]	
	Linportexcs	CIA CHE	
Cortificato			

Site Information		
Site Information	Enabled	
Users :	Disabled	
Site Name :	No Site Name	
Site Contact :	No Site Contact	
Cita Lagation :	No Site Location	
Site Location :		

Security Banner		ſ
Enable Security Banner during	© Enabled	
Login :	Oisabled	
Security Banner Notice :	4	
User must accept	Enabled	•
before login :	Disabled	

Attribute	Meaning
Authentication Key 128-bit	Only if the AP to which this SM will register requires authentication, specify the 128- bit key that the SM will use when authenticating. For alpha characters in this 32- character hex key, use only upper case.
Select Key 128- bit	Refer Security Page 450 Platform Family APfor parameter details.
Disable AES 128- bit	
Authentication Key 256-bit	
Select Key 256- bit	
Enforce Authentication	The SM may enforce authentication types of AAA and AP Pre-sharedKey. The SM will not finish the registration process if the AP is not using the configured authentication method (and the SM locks out the AP for 15 minutes).
Phase 1	The protocols supported for the Phase 1 (Outside Identity) phase of authentication are EAPTTLS (Extensible Authentication Protocol Tunneled Transport Layer Security) or MSCHAPv2 (Microsoft Challenge-Handshake Authentication Protocol version 2).

Attribute	Meaning		
Phase 2	Select the desired Phase 2 (Inside Identity) authentication protocol from the Phase 2 options of PAP (Password Authentication Protocol), CHAP (Challenge Handshake Authentication Protocol), and MSCHAP (Microsoft's version of CHAP, version 2 is used). The protocol must be consistent with the authentication protocol configured on the RADIUS server.		
Identity/Realm	If Realms are being used, select Enable Realm and configure an outer identity in the Identity field and a Realm in the Realm field. These must match the Phase 1/Outer Identity and Realm configured in the RADIUS server. The default Identity is "anonymous". The Identity can be up to 128 non-special (no diacritical markings) alphanumeric characters. The default Realm is "canopy.net". The Realm can also be up to 128 non-special alphanumeric characters.		
	Configure an outer Identity in the Username field. This must match the Phase 1/Outer Identity username configured in the RADIUS server. The default Phase 1/Outer Identity Username is "anonymous". The Username can be up to 128 non-special (no diacritical markings) alphanumeric characters.		
Username	Enter a Username for the SM. This must match the username configured for the SM on the RADIUS server. The default Username is the SM's MAC address. The Username can be up to 128 non-special (no diacritical markings) alphanumeric characters.		
Password	Enter the desired password for the SM in the Password and Confirm Password fields. The Password must match the password configured for the SM on the RADIUS server. The default Password is "password". The Password can be up to 128 non- special (no diacritical markings) alphanumeric characters		
Upload Certificate File	To upload a certificate manually to a SM, first load it in a known place on your PC or network drive, then click on a Delete button on one of the Certificate description blocks to delete a certificate to provide space for your certificate. Click on Choose File, browse to the location of the certificate, and click the Import Certificate button, and then reboot the radio to use the new certificate.		
	When a certificate is in use, after the SM successfully registers to an AP, an indication of In Use will appear in the description block of the certificate being used.		
	The public certificates installed on the SMs are used with the private certificate on the RADIUS server to provide a public/private key encryption system.		
	Up to 2 certificates can be resident on a SM. An installed certificate can be deleted by clicking the Delete button in the certificate's description block on the Configuration > Security tab. To restore the 2 default certificates, click the Use Default Certificates button in the RADIUS Certificate Settings parameter block and reboot the radio.		
Encryption Setting	Specify the type of airlink security to apply to this SM. The encryption setting must match the encryption setting of the AP.		
	None provides no encryption on the air link.		

Attribute	Meaning		
	AES (Advanced Encryption Standard): An over-the-air link encryption option that uses the Rijndael algorithm and 128-bit keys to establish a higher level of security. AES products are certified as compliant with the Federal Information Processing Standards (FIPS 197) in the U.S.A.		
Web, Telnet, FTP Session Timeout	Enter the expiry in seconds for remote management sessions via HTTP, telnet, or FTP access to the SM.		
Ethernet Access	If you want to prevent any device that is connected to the Ethernet port of the SM from accessing the management interface of the SM, select Ethernet Access Disabled. This selection disables access through this port to via HTTP (the GUI), SNMP, telnet, FTP, and TFTP. With this selection, management access is available through only the RF interface via either an IP address (if Network Accessibility is set to Public on the SM) or the Session Status or Remote Subscribers tab of the AP.		
	Note This setting does not prevent a device connected to the Ethernet port from accessing the management interface of other SMs in the network. To prevent this, use the IP Access Filtering Enabled selection in the IP Access Control parameter of the SMs in the network. See IP Access Control below.		
	If you want to allow management access through the Ethernet port, select Ethernet Access Enabled. This is the factory default setting for this parameter.		
IP Access Control	You can permit access to the SM from any IP address (IP Access Filtering Disabled) or limit it to access from only one, two, or three IP addresses that you specify (IP Access Filtering Enabled). If you select IP Access Filtering Enabled, then you must populate at least one of the three Allowed Source IP parameters or have no access permitted from any IP address		
Allowed Source IP 1 to 3	If you selected IP Access Filtering Enabled for the IP Access Control parameter, then you must populate at least one of the three Allowed Source IP parameters or have no access permitted to the SM from any IP address. You may populate as many as all three.		
	If you selected IP Access Filtering Disabled for the IP Access Control parameter, then no entries in this parameter are read, and access from all IP addresses is permitted.		
	A subnet mask may be defined for each entry to allow for filtering control based on a range of IP addresses.		
Web Access	The Radio supports secured and non-secured web access protocols. Select suitable web access from drop-down list:		
	• HTTP Only - provides non-secured web access. The radio to be accessed via http:// <ip of="" radio="">.</ip>		
	<ul> <li>HTTPS Only – provides a secured web access. The radio to be accessed via https://<ip of="" radio="">.</ip></li> </ul>		
	<ul> <li>HTTP and HTTPS – If enabled, the radio can be accessed via both http and</li> </ul>		

Attribute	Meaning		
	https.		
SNMP	This option allows to configure SNMP agent protocol version. It can be selected from drop-down list :		
	Disable SNMP - To disable SNMP agent.     SNMPv2c Only = Enables SNMPv2c protocol		
	<ul> <li>SNMPv2c Only - Enables SNMP v2c protocol.</li> <li>SNMPv3 Only - Enables SNMP v3 protocol. It is secured communication protocol.</li> </ul>		
	<ul> <li>SNMPv2c and SNMPv3 – It enables both the protocols.</li> </ul>		
Telnet	This option allows to Enable and Disable Telnet access to the Radio.		
FTP	This option allows to Enable and Disable FTP access to the Radio.		
TFTP	This option allows to Enable and Disable TFTP access to the Radio.		
Site Information viewable to Guest Users	This option allows to Enable or Disable displaying site information with Guest users.		
Site Name	Specify a string to associate with the physical module.		
Site Contact	Enter contact information for the module administrator.		
Site Location	Enter information about the physical location of the module.		
Enable Security	Enable: The Security Banner Notice will be displayed before login.		
Banner during Login	Disable: The Security Banner Notice will not be displayed before login.		
Security Banner Notice	User can enter ASCII (0-9a-zA-Z newline, line-feed are allowed) text up-to 1300 characters.		
User must accept security	Enable: login area (username and password) will be disabled unless user accepts the security banner.		
banner before login	Disable: User can't login to radio without accepting security banner.		

## Security page -450 Platform Family BHS

The Security page of 450 Platform Family BHS is explained in below table.

Table 40: Security attributes - 450 Platform Family BHS

Authentication Key Settings			3	
Authentication Key 128-bit :			(Using All 0xFF's Key)	
Disable AES-128 :	AES-128 AES-128	Encryption Encryption	Disabled Available	
Authentication Key 256-bit :	(Using All 0xFF's Key)			
Session Timeout				
Web, Telnet, FTP Session Timeout :	600 S	econds		
IP Access Filtering			1	
IP Access Control :	<ul> <li>IP Access Filtering Enabled - Only allow access from IP addresses specified below</li> <li>IP Access Filtering Disabled - Allow access from all IP addresses</li> </ul>			
Allowed Source IP 1 :	0.0.0	/ 32	Network Mask (set to 32 to disable)	
Allowed Source IP 2 :	0.0.0	/ 32	Network Mask (set to 32 to disable)	
Allowed Source IP 3 :	0.0.0	/ 32	Network Mask (set to 32 to disable)	
Security Mode				
Web Access :	HTTP Only	•		
SNMP :	SNMPv2c Only	•		
Teinet :	Enabled     Disabled			
FTP :	Enabled Disabled			
TFTP :	Enabled Disabled			

Site Information	
Site Information Viewable to Guest Users :	Enabled     Disabled
Site Name :	No Site Name
Site Contact :	No Site Contact
Site Location :	No Site Location

Security Banner		1
Enable Security Banner during Login :	Enabled     Disabled	
Security Banner Notice :	I	111
User must accept security banner before login :	Enabled     Disabled	-

Attribute	Meaning
Authentication Key	Only if the BHM to which this BHS registers requires an authentication, specify the key that the BHS will use when authenticating. For alpha characters in this hex key, use only upper case.
Disable AES 128-bit	Refer Security Page 450 Platform Family AP for parameter details.
Authentication Key 256-bit	
Web, Telnet, FTP Session Timeout	Enter the expiry in seconds for remote management sessions via HTTP, telnet, or FTP access to the BHS.
IP Access Control	You can permit access to the BHS from any IP address (IP Access Filtering Disabled) or limit it to access from only one, two, or three IP addresses that you specify (IP Access Filtering Enabled). If you select IP Access Filtering Enabled, then you must populate at least one of the three Allowed Source IP parameters or have no access permitted from any IP address
Allowed Source IP 1 to 3	If you selected IP Access Filtering Enabled for the IP Access Control parameter, then you must populate at least one of the three Allowed Source IP parameters or have no access permitted to the BHS from any IP address. You may populate as many as all three.
	If you selected IP Access Filtering Disabled for the IP Access Control parameter, then no entries in this parameter are read, and access from all IP addresses is permitted.
	A subnet mask may be defined for each entry to allow for filtering control based on a range of IP addresses.

Attribute	Meaning
Frequency Band	See PMP 450m AP Radio attributes - 5 GHz
Transmit Power	
Carrier Assignment	
Frequency Carrier	
Channel Bandwidth	
Cyclic Prefix	
Frame Period	
Color Code	
Subscriber Color Code Rescan (When not on a Primary Color Code)	
Subscriber Color Code Wait Period for Idle	
Installation Color Code	
Sector ID	
MIMO Rate Adapt Algorithm	
Downlink Maximum Modulation Rate	
Uplink Maximum Modulation Rate	
Nomadic Mode	
Max Range	
Downlink Data	

Attribute	Meaning
Contention Slots	See PMP 450 MicroPoP Unlimited AP Radio attributes - 5 GHz
Auto Contention	
Broadcast Repeat Count	
External Gain Fixed	
SM TX Power Control	
SM Receive Target Level	
Multicast Data Channel	
Multicast Repeat Count	
Multicast Downlink CIR	
SM Registration Limit	
SM Registration	
Receive Quality Debug	
SM Link Test Mode Restriction	
## Radio page - 450v SM 5/6 GHz

#### Figure 35: 450v SM Radio attributes - 5/6 GHz

Ratio Con	figuration.														
Radio Freq	peticy Sca	e Şekazîve	UNE:												
5.1 GH	1														
12.22	Same	-	-	-		- Anna	232.03	222110	11250.1	20.000	10000	10000	12310-9	- 1233	10000
8742-8	0108.0	1.00000	0.0010	C.19760.0	L http://	L.ATATAR	0.0179	0.0173.9	0.9176.0	CHERY &	0.9180.0	0.9582.0	0.0195.0	09197.5	C:9190.0
100000	1281019	110797.5	101200.0	128409.8	110205-0	115207.0	118210-0	-1212.8	Charle	1.24.0 %	1.9440.0	54222.0	1.18228.0	1.8227.5	110230.0
(-10404.8)	Linesee	- Barrow	1.00mm	1,19942.0	8040-0	- spens									
10000															
5.2 GPU	£														
175252.5	0.8255.0	3257.8	10200.0	C1242.2	0.10010	13247.8	0.0270.0	01272.8	\$275.0	0 5277.8	115250,0	05262.0	0.5285.0	0 8287.5	(15200.0
0.5282.5	C \$296.0	118297.5	0.5503.0	C1530823	3305-0	C 8807.5	06350-0	C8842.8	\$3015.0	0.6947.6	115326-0	05322.8	115825.0	0332/.5	C 8300.8
[]]B0002.II	CHAMAGE	0007.5	CISMUE	3342.5	CHHAD	8347.5	4380.0	4343.8	8366.0	8367-8	\$366-0	\$382.4	8385-0	6267.6	8370.0
6372-5	4574.5	\$377.8	5386.0	4940-8	8365-0	8087.8	6390-0	5352.8	6266.0	8367.6	\$400-0	8402.8	8408-0	\$407.8	8415.0
8412.8	pera.c	8417.8	9420-0	8420.8	8428-0	9427.8	. 8430-0	8432-8	. 8428-2	6437-8	5++0-0	8442.8	8445.0	8441.0	8489.0
Santo S	ease of	- serve	5493-0	-	A455-0	- Marrie									
5.4 GH	2														
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0.0002.6	03565/0	118557.8	D10000-0	0.8562.8	00005-0	0.8867.8	08870.0	06872.8	04675.0	0.8677.8	0.9980.0	0355226	05585.0	0 6687.6	C18090.0
C15002.5	C \$505.0	0.9887.8	100000	C9402.8	1.000 D	THERE &	Citerio.o.	DB012A		C8817.8	0.0588	C1822/8	Cite25 a	08427.5	179000.0
190325	CHORA	C10437.8	0.0040.0	C0642.0	0045.0	0.8647.8	5650.0	C \$652.8	0.5055.0	D3657.5	0 5000.0	CSMER	105005.0	0.0067.5	0.001010
15672.5	C-6675.0	0.5677.8	(36660.E	C75682-5	1.) 8685 Ø	1.16667.5	106660.0	125692.8	0.5696.0	120097.8	0.5700.0	0.9702.6	C18705.0	CAMILS	0.0010000
LISTIGR	13710.0	03737.5	C18/20.6	1.18722.8											
5.7 GH	π.														
4720.4	4730-0	-	CATION	C8737.8	0.0140.0	CHEVRON B	00740.0	Ontern	51710.0	Ciercia's	0.6700.0	0 8797.0	0.9780.0	04282.6	CODING D
05/07.5	D\$779.0	09772.6	Oprime	C6777.8	0.0000.0	08782.5	0.6796.0	Demin.	05740.0	DENDE	0.6785.0	CAPACA	015800.0	C SMOL S	09905.0
0.5007.5	C ferto a	115912.5	Citeras	C 5817.8	115820.0	0.6622.8	0.5623.0	0.5677.5	0.5830.0	0.5632.5	0.6635.0	0.6857.5	(18840.0.	0.5542.5	0.0045.0
0.5847.6	5650.0	116652.6	(16865.0	1.9887.5	116660.0	C16662.5	C16985.0	05667.8	6 5470.0	13872.6	0.6675/8	<b>CIMITA</b>	101600000	5882.5	C/9983.0
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n GHz I	0-10-6														
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0.6087.6	114040.0	0.0002,8	00005-0	24097.8	0.0010	08102.8	04105.0	06107.8	0.0110.0	110112.0	0.6115.0	00117.6	04122.0	10122.5	00125.0
Central	04150.0	1781323	Carose	04997.8	0140 D	Ce142.8	100140.0	Cetattà	08150.0	0.0002.5	110156/0	08157.0	CR1800	04142.5	C.6165.D
00107.5	0.6170,0	0)8172.5	06175.8	0.4177.4	0.0610	100182.5	C-0185.0	00167.8	0190.0	0192.5	0.0195.0	04197.5	0,6200,0	6202.6	C 6205.D
0.6207.5	0.0210.0	0.00232.0	-0.6216.0	0.6297.6	0.0220.0	1.162222.8	0225.0	0.0227.8	04230.0	0.0232.8	0.00290.0	0.0237.5	0.0040.0	04242.5	6245.0
CIN297.5	Calebook	100000	10000.0	COMPANY.	116000-0	1.4252.0	1.0200-0	Cinter a	0.00220.0	002725	1.6210.0	0.0277.0	10280.0	04435.6	1.16200.0
C 83377 K	D #810/P	Citerian.	04000.0	0.0237.8	0 6340.0	114542.8	Cathanyi	085479	Caston	Danie K.	CASSAR	04957.8	Classics	14542.5	0 6365.0
Cene/ si	04970.0	08372.5	Casroe	Ce377.6	Cessop	Central	00001.0	Departs.	0.0390.0	D0992.8	114056.0	Oemra	C8400.0	00002.6	00000
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-	Canada	Ciente.	CHENKE	Castra .	C MARKEN	Canada	Colisto.	118547.5	114555.0	10000	Hatten	110357.6		Canada	1.6555.0
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6647.5	00000	110052.11	10055.0	124667.8	0.0000	116662.5	0.0005.0	0.0007.0	0.0075.0	0072.5	0.6675.0	00077.6	110000.0	06682.5	0685.0
09887.5	0.6656.0	0.0082.6	00000.0	C4687.A	0.000.0	0.6722,8	0.00705.0	0.6707.8	0.0710.0	0.0712.5	04715.0	04717.8	08720.0	04722.5	0.0725.0
0.6727.6	C16750.0	口(約2.5	20100.0	□ #737.0	0.6740.0	CHINES	00748.0	06747.3	C8750.8	16752.9	116756/8	04/67.6	C16700.0	04782.5	C10705.0
06767.5	06770.0	08772.5	04775.0	〇. #777.治	0.06780.0	(16782.5	0.66785.0	Central	08790.0	Denus	116705,0	08797,8	176600.0	06807.6	0.806.0
0.0007.5	00010.0	0.00012.5	CHREAD	0.04417.8	L, (6520.D	1.08822.5	0625-0	C16027.5	0.08830.0	HI132.8	116655.0	06837.6	0.6640.0	06642.5	CHHOLD
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Attribute	Meaning
Custom Radio Frequency Scan Selection List	See PMP 450i SM Radio attributes - 5 GHz
Channel Bandwidth Scan	
Cyclic Prefix Scan	
AP Selection Method	
Color Code 1	
Installation Color Code	
Large Data Channel data Q	
Color Code	
MIMO Rate Adapt Algorithm	
Downlink Maximum Modulation Rate	
Uplink Maximum Modulation Rate	
Nomadic Mode	
External Gain Fixed	
Enable Max Tx Power	
Reference Downlink EVM	
Current Downlink EVM	
Reference Uplink EVM	
Current Uplink EVM	
Access Point MAC Address	
Channel Frequency	
Channel Bandwidth	
Receive Quality Debug	

## PMP/PTP 450i Series - Configuring Radio

Radio page - PMP 450i or 450 MicroPoP Unlimited AP 5 GHz

The Radio tab of the PMP 450i or 450 MicroPoP Unlimited AP contains some of the configurable parameters that define how an AP operates.

#### Table 45: PMP 450i or 450 MicroPoP Unlimited AP Radio attributes - 5 GHz

Device Type	
Device Setting :	• AP
	○ SM
Radio Configuration	
Frequency Band :	54 GHz ¥
Frequency Carrier :	5535.0 V Current Active Frequency
Channel Bandwidth :	EMHz V
Frame Period :	○ 5.0 ms ● 2.5 ms
Cyclic Prefix :	One Sixteenth
Color Code :	20 (0-254)
Subscriber Color Code Rescan (When not on a Primary Color Code) :	0 Minutes (0 - 43200)
Subscriber Color Code Wait Period for Idle :	0 Minutes (0 - 60)
Installation Color Code :	Enabled     Disabled
Sector ID :	I V
MAC Control Parameters	Table 1.0
MIMO Rate Adapt Algorithm :	WVCAB V
Downlink Maximum Modulation Rate :	
Uplink Maximum Modulation Rate :	la v
Nomadic Mode :	Enabled     Disabled
Frame Configuration	
Max Range :	8 [km 👽] (Range: 1 — 40 miles / 64 km)
Downlink Data :	76 % (Range: 15 - 85 %)
Contention Slots :	3 (Range: 1 - 4)
Auto Contention :	Enabled     Disabled
Broadcast Repeat Count :	2 (Range: 0 - 2 )
Power Control	
Transmit Power :	dBm (Range: -30 — +27 dBm) (-3 dBm V / -3 dBm H)
External Gain Fixed :	17 dBi
SM Receive Target Level :	41 dBm (Range: -77 — -37 dBm) combined power
Adjacent Channel Support :	Enabled     Disabled
Multicast Data Control	
Multicast Data Channel :	Disable 🗸
Multicast Repeat Count :	0 (Range: 0 - 2)
Multicast Downlink CIR :	0 (kbps)

Advanced		100000			
SM Registration Limit	218 (Range 1-	- 298)			
5M Registration	# A8 (450/450) © 450(-Doty				
Receive Quality Debug	Enabled Disabled				
Frame Alignment Legacy Mode	Choose Legacy Mor software revision an Sync Src \ SW Rev	te setting from th d sync source 13.4.1 or higher	e table belov	v based on co	focated radio's below 12.0
	Timing Port	OFF	OFF	OFF	OFF
	Power Port	OFF	OFF	ON (Mode 1	OFF
SM Link Test Mode Restriction :	0 Enabled				

Attribute	Meaning
Device Setting	To configure the radio as an Access Point, select AP.
	To configure the radio as a Subscriber Module, select SM.

Attribute	Meaning
Frequency Band	See PMP 450m Series - configuring radio
Frequency Carrier	
Alternate Frequency Carrier 1 and 2	Whenever the radio detects a radar pulse in either Channel Availability Check or In-Service Monitoring Modes on carrier frequency it moves the operation to a frequency configured as Alternate Frequency Carrier 1. If the radio detects a radar pulse on Alternate Frequency Carrier 1, it moves the operation to a frequency configured as Alternate Frequency Carrier 2. If the radio detects a radar pulse on Alternate Frequency Carrier 2 it moves the operation back to carrier frequency. So, there are three options in round-robin formation.
	These parameters are displayed based on Regional Settings. Refer Country
Channel Bandwidth	See PMP 450m Series – configuring radio
Frame Period	
Cyclic Prefix	
Color Code	
Subscriber Color Code Rescan (When not on a Primary Color Code)	
Subscriber Color Code Wait Period for Idle	
Installation Color Code	
Sector ID	
MIMO Rate Adapt Algorithm	See PMP 450m Series – configuring radio
Downlink Maximum Modulation Rate	
Uplink Maximum Modulation Rate	
Nomadic Mode	Allows the movement of SMs within a sector. A feature key is required to enable this feature at the AP. This mode must also be enabled for the subset of SMs that an operator wishes to use with this mode.
Max Range	450 MicroPoP has a limit of 2 miles.
	To unlock from MicroPoP to MicroPoP Unlimited, a feature key must be purchased to remove this limitation.

Attribute	Meaning			
Downlink Data	See PMP 450m Series – configuring radio			
Contention Slots (a.k.a. Control Slots)	This field indicates the number of (reserved) Contention slots configured by the operator. The SM uses reserved Contention slots and unused data slots for bandwidth requests. See Contention slots			
Auto Contention	This parameter allows the operator to enable or disable Auto Contention.			
Broadcast Repeat Count	The default is 2 repeats (in addition to the original broadcast packet, for a total of 3 packets sent for everyone needed), and is settable to 1 or 0 repeats (2 or 1 packets for every broadcast).			
	ARQ (Automatic Repeat reQuest) is not present in downlink broadcast packets, since it can cause unnecessary uplink traffic from every SM for each broadcast packet. For successful transport without ARQ, the AP repeats downlink broadcast packets. The SMs filter out all repeated broadcast packets and, thus, do not transport further.			
	The default of 2 repeats is optimum for typical uses of the network as an internet access system. In applications with heavy download broadcast such as video distribution, overall throughput is significantly improved by setting the repeat count to 1 or 0. This avoids flooding the downlink with repeat broadcast packets.			
Transmit Power	This value represents the combined power of the AP's two transmitters.			
	Nations and regions may regulate transmitter output power. For example			
	<ul> <li>900 MHz, 5.4 GHz and 5.8 GHz modules are available as connectorized radios, which require the operator to adjust power to ensure regulatory compliance.</li> </ul>			
	The professional installer of the equipment has the responsibility to			
	<ul> <li>maintain awareness of applicable regulations.</li> <li>calculate the permissible transmitter output power for the module.</li> <li>confirm that the initial power setting is compliant with national or regional regulations.</li> <li>confirm that the power setting is compliant following any reset of the module to factory defaults.</li> </ul>			
External Gain	This value needs to correspond to the published gain of the antenna used to ensure the radio will meet regulatory requirements.			
SM Receive Target Level	See PMP 450m Series – configuring radio			
Adjacent Channel Support	For some frequency bands and products, this setting is needed if AP is operating on adjacent channels with zero guard band.			
Multicast Data Channel	This pull-down menu of the Multicast Data Control screen helps in configuring multicast packets to be transmitted over a dedicated channel at a configurable rate of 2X, 3X, 4X, 5X or 6X. The default value is "Disable". If set to the default value, all multicast packets are transmitted over the Broadcast VC data path.			

Attribute	Meaning	Meaning				
Multicast Repeat Count	This value packet rec (like Broad guarantee packets gu they can u throughpu	This value is the number of packets that are repeated for every multicast VC packet received on the AP (located under Radio tab of Configuration). Multicast (like Broadcast) packets go over a VC that is shared by all SMs, so there is no guaranteed delivery. The repeat count is an attempt to improve the odds of the packets getting over the link. If the user has issues with packets getting dropped, they can use this parameter to improve the performance at the cost of the overall throughput possible on that channel. The default value is 0.				
Multicast Downlink CIR	This value (located u range of tl repeat cou	This value is the committed information rate for the multicast downlink VC (located under the Radio tab of Configuration). The default value is 0 kbps. The range of this parameter is based on the number of repeat counts. The higher the repeat count, the lower the range for the multicast downlink CIR.				
SM Registration Limit	This paran register to	neter allows to configure the limit fo a PMP AP. The configurable range i	r maximum number of SMs that can s from 1 to 238.			
	450 Micro Unlimited,	450 MicroPoP has a limit of 20 SMs. To unlock from MicroPoP to MicroPoP Unlimited, a feature key must be purchased to remove this limitation.				
	2	<b>Note</b> SM trying to register after the ma reached is locked out for 15 minut the SM.	ximum configured limit has been es and a message is displayed at			
SM Registration	All: This fie	eld allows to control registration of a 450 Series SM (450i/450b/450/430	II type 450 Platform Family SM )) or 450i Series SM.			
	450i Only: This field allows to control registration of 450i Series SM only					
Receive Quality Debug	To aid in li fragments (polarizati	nk performance monitoring, the AP received per modulation (i.e. QPSK, on).	and SM now report the number of 16-QAM, 64-QAM) and per channel			
	2	Note Due to CPU load, this will slightly degrade packet per second processing.				
Frame Alignment Legacy Mode	Mode	Behavior (non-900 MHz radios)	Behavior (FSK 900 MHz radios)			
	OFF	By default, frame start is aligned with devices with Timing Port synchronization	By default, frame start is aligned with FSK 900 MHz devices with Timing Port synchronization			
		If the synchronization source changes (due to Autosync or otherwise) the radio will dynamically adjust its frame start to maintain alignment with the default frame start timing	If the synchronization source changes (due to Autosync or otherwise) the radio will dynamically adjust its frame start to maintain alignment with the default frame start timing			

Attribute	Meaning				
	Mode	Behavior (non-900 MHz radios)	Behavior (FSK 900 MHz radios)		
	ON (Mode 1)	The radio will align with devices running software versions from 12.0 to 13.4.	The radio will align with FSK 900 MHz devices running software versions from 12.0 to 13.4.		
	ON (Mode 2)	N/A	The radio will align with FSK 900 MHz devices with software versions 11.2 or older.		
SM Link Test Mode Restriction	Set to Enabled to allow only SM initiated link tests that pass user traffic. Set to Disabled to allow all SM initiated link tests.				

### Radio page - PMP 450i AP 3 GHz

#### The Radio tab of the PMP 450i AP 3 GHz is shown in below table.

Table 46: PMP 450i AP Radio attributes - 3 GHz

Device Type	
Device Settion	# AP
active desired :	© SM
Charles and the second s	
Englishing Rand	35.000 •
Frequency Danu	A GARE *
Channel Bandwith	NOTE *
Channels Denumber	(15.0 mm)
Frame Period	#25ms
Cyclic Prefix :	Che Sixteenth
Color Code	0 (0-254)
Subscriber Color Code Rescan (When not on a Primary Color Code)	0 Minutes (0 43200)
Subscriber Color Code Wait Period for Idle :	0 Minutes (0 - 60)
Installation Color Code	© Enabled * Disabled
Sector ID	0.
1910 Rate Education	(Instat w)
Develop Calls Supplement	E CI
Linish Maximum Medulator Rate	E OI
Alexandra and a second se	# Enabled
NUMBER AND	C Disabled
Frame Configuration	10
Max Range :	1. (miss • (Range, 1 - 40 miles / 64 km)
Downlink Data	15 % (Range 15 85 %)
Contention Slots	<ul> <li>(Range: 1 - 15)</li> </ul>
Auto Contention :	Enabled     Disabled
Broadcast Repeat Count	2 (Range 0-2)
Co-located Frame Configuration Option	Cierra Y)

Power Central	A REAL PROPERTY AND A REAL PROPERTY AND A REAL PROPERTY.
Transmit Power	dBm (Range -30 +27 dBm) (-3 dBm V / -3 dBm H)
Enternal Gain Fixed	17 effi
SM Receive Target Level	dbm (Range: -7737 dbm) combined power
Adjacent Channel Support	<ul> <li>Enabled</li> <li>Obsabled</li> </ul>
Multicast Data Control	
Multicast Data Channel	Diane V
Multicast Repeat Court	6 (Rarge 9 - 2)
Muticast Downlink CIR	d (Abps)

Advanced						
SM Registration Limit :	238 (Range: 1 - 238)					
Receive Quality Debug :	Enabled     Bisabled					
Frame Alignment Legacy Mode :	Choose Legacy Mode setting from the table below based on colocated radio's software revision and sync source: Sync Src.\ SW Rev. 13.4.1 or higher (2055 cm) (2055 cm) (2055 cm)					
	Timing Port OFF OFF OFF					
	Power Port OFF OFF ON (Mode 1) OFF					
SM Link Test Mode Restriction :	© Enabled ® Disabled					



### Note

Refer PMP/PTP 450i Series - Configuring Radio and PMP 450i SM Radio attributes - 5 GHz for parameter details.



#### Note

Only the frequencies available for your region and the selected Channel bandwidth are displayed.

## Radio page - PMP 450i AP 900 MHz

The Radio tab of the PMP 450i AP 900 MHz is described in below table.

#### Table 47: PMP 450i AP Radio attributes - 900 MHz

* AP. 0 \$M		
0.54		
None •		
10 MHz +		
# 2.5 ms		
One Sudeenth		
9 (0-254)		
8 Minutes (0 - 43200)		
Minutes (0 60)		
© Enabled		
3 .		
MACAR N		
(b. v)		
Ecutived		
difference of the second s		
3 miles • (Range 1 - 120 miles / 195 km)		
75 % (Range: 15 85 %)		
3 (Range 1 - 12)		
Enabled = Dnabled		
2 (Range. 0 - 2)		
22 dBm (Range: -30 +25 dBm) (19 dBm V / 19 dBm Hi		
0 dBi (Range 0 +40 dBi)		
52 dBm (Range: -7737 dBm) combined power		
Diable •		
(Bange 0 - 2)		
(stos) (Dinne 0 - 2062 stos)		

Advanced					
SM Registration Limit	238 (Range 1 - 238)				
Receive Quality Debug :	Enabled     Tisabled				
Pager Reject Filter	<ul> <li>Enabled</li> <li>Disabled</li> <li>(NOTE: Frequencies 920 MHz and above will not work when enabled.)</li> </ul>				
	Choose Legacy Mode setting from the table below based on colocated 900 MHz FSK's software revision and svinc source:				
Frame Alignment Legacy Mode :	Sync Src.\ SW Rev. 13.4.1 or higher 12.0 to 13.4 below 12.0				
	Timing Port OFF OFF OFF				
	Power Port OFF ON (Mode 1) ON (Mode 2)				
SM Link Test Mode Restriction :	Enabled  Disabled				

Attribute	Meaning		
Device	To configure the radio as an Access Point, select AP.		
Setting	To configure the radio as a Subscriber Module, select SM.		
Frequency Carrier	Specify the frequency for the module to transmit. The default for this parameter is None. For a list of channels in the band, see the drop-down list on the radio GUI.		
Channel Bandwidth	The channel size used by the radio for RF transmission. The setting for the channel bandwidth must match between the AP and the SM. The supported Channel Bandwidths are 5, 7, 10 and 20 MHz.		
Frame Period	Refer PMP 450m AP Radio attributes - 5 GHz for parameter details		
Cyclic Prefix			
Color Code			
Subscriber Color Code Rescan (When not on a Primary Color Code)			
Subscriber Color Code Wait Period for Idle			
Installation Color Code			
Sector ID			
MIMO Rate Adapt Algorithm			
Downlink Maximum Modulation Rate	This pull-down menu helps in configuring the Downlink Maximum Modulation Rate at a configurable rate of 1X, 2X, 3X, 4X, 5X, 6X, 7X or 8X. The default value is "8X". The Rate Adapt Algorithm does not allow the modulation to go beyond this limit.		
Uplink Maximum Modulation Rate	This pull- down menu helps in configuring the Uplink Maximum Modulation Rate at a configurable rate of 1X, 2X, 3X, 4X, 5X, 6X, 7X or 8X. The default value is "8X". The Rate Adapt Algorithm does not allow the modulation to go beyond this limit.		
Nomadic Mode	Allows the movement of SMs within a sector. A feature key is required to enable this feature at the AP. This mode must also be enabled for the subset of SMs that an operator wishes to use with this mode.		

Attribute	Meaning
Max Range	Refer PMP 450m AP Radio attributes - 5 GHz for parameter details
Downlink Data	
Contention Slot (a.k.a. Control Slots)	
Auto Contention	
Broadcast Repeat Count	
Transmitter Output Power	
External Gain	
SM Receive Target Level	
Multicast Data Channel	Refer Radio page - PMP 450i or 450 MicroPoP Unlimited AP 5 GHz for parameter details
Multicast Repeat Count	Refer PMP 450m AP Radio attributes - 5 GHz for parameter details
Multicast Downlink CIR	
SM Registration Limit	
Receive Quality Debug	
Pager Reject Filter	In 900 MHz, Pager Reject filter is placed on the AP to block Pager signals which could cause interference to the whole band. The Pager signals typically operate in the 928-930 frequency range. When the filter is enabled, the signals of 920 MHz and above are attenuated which enables better reception of signals in the rest of the band. Note that the AP/SM should not be configured on the frequencies of 920 MHz and above when this filter is enabled.
Frame Alignment Legacy Mode	Refer PMP 450m AP Radio attributes - 5 GHz for parameter details
SM Link Test Mode Restriction	

### Radio page - PMP 450i SM 5 GHz

The Radio page of PMP 450i SM is explained in below table.

Table 48: PMP 450i SM Radio attributes - 5 GHz

Radio Configuration							
	4.9 GH	z					
	No custom	frequencie	s present.				
	5.1 GH	z					
	5152.5	5105.0	5157.5	₹ 5160.0	Y 5162.5	× 5165.0	1.5167.5
	¥ 5170.0	# 5172.5	# 5175.0	₹ 6177.6	# 5180.0	M 5182.5	W 5185.0
	# 5187.5	# 5190.0	# 5192.5	# 5195.0	# 5197.5	# 5200.0	¥ 5202.5
	₩ 5205.0	# 5207.5	# 5210.0	₹ 5212.5	# 5215.0	# 5217.5	# 5220.0
	# 5222.5	# 5225.0	# 5227.5	₹ 5230.0	* 5232.5	× 5235 0	+ 5237 5
	+ 5240.0	5242.5	5245.0	52,47.5			
	5.2 GH	z					
	5252 5	5255.0	5257 5	7 5260 6	¥ 5262 5	2 5265 0	1 5367 5
	₹ 5270.0	# 5272 5	₩ 5275.0	# 5277 5	# 5280.0	# 5282 5	₩ 5285.0
	₹ 5287 5	€ 5290.0	¥ 5292 5	₹ 5295.0	€ 5297 6	₹ 5300.0	# 5302 5
	# 5305.0	₹ 5307.5	¥ 5310.0	0 5312 5	# 5315.0	# 5317.5	₹ 5320.0
	₹ 5322.5	₹ 5325.0	₹ 5327.5	₹ 5330.0	V 5332.5	× 5335 0	+ 5337.5
	2 5340.0	5342.5	5345.0	5347.5		100000000000000000000000000000000000000	
	5.4 GH	z					
	5472.5	5475.0	5477.5	16480.0	\$ 5482.5	2 5485.0	€ 5487.5
	# 5490.0	# 5492.5	# 5495.0	# 5497.5	# 5500.0	# 5502.5	H 5505.0
	# 5507.5	# 5510.0	# 5512.6	# 5515.0	# 5517.5	# 5520.0	# 5522.5
	¥ 5525.0	# 5527.5	# 5530.0	# 5532.5	# 5535.0	# 5537.5	# 5540.0
	₹ 5542.5	R 5545.0	€ 5547.5	₹ 5550.0	8 5552.5	₹ 5555.0	R 5557.5
	# 5560.0	W 5552.5	# 5565.0	# 5567.5	# 5570.0	# 5572.5	# 5575.0
	# 5577.5	# 5680.0	# 5582.5	₹ 5565.0	# 5587.5	# 5590.0	# 5592.5
Custom Radio Frequency Scan Selection List	¥ 5595.0	¥ 5597.5	¥ 5600.0	K 5602.5	₩ 5605.0	¥ 5607.5	₹ 5610.0
	# 5612.5	# 5615.0	# 5617.5	# 5620.0	# 5622.5	# 5525.0	₩ 5627 5
	₹ 5630.0	€ 5632.5	€ 5635.0	₹ 5637 5	₹ 5640,0	₹ 5642.5	R 5645.0
	¥ 5647.5	¥ 5650.0	¥ 5652.5	₹ 5655.0	# 5657.5	₩ 5660.0	¥ 5662.5
	# 5665.0	91 5667.5	₹ 5670.0	# 5672.5	# 5675.0	₹ 5677.5	₩ 5680.0
	# 5682.5	# 5685.0	₩ 5687.5	# 5690.0	# 5692.5	# 5695.0	# 5697.5
	₹ 5700.0	# 5702.5	# 5705.0	2 5707.5	1 5710.0	+ 5712.5	* 5715.0.
	5717.6	5720.0	5722.5				

	5.7 GHz
	2 5727 5 2 5730 0 2 5732 5 2 5735 0 2 5737 5 2 5740 0 2 5742 5
	# 5745.0 # 5747.5 # 5750.0 # 5752.5 # 5755.0 # 5757.5 # 5760.0
	# 5762.5 # 5765.0 # 5767.5 # 5770.0 # 5772.5 # 5775.0 # 5777.5
	# 5780.0 # 5782.5 # 5785.0 # 5787.5 # 5790.0 # 5792.5 # 5795.0
	# 5797.5 # 5800.0 # 5802.5 # 5805.0 # 5807.5 # 5810.0 # 5812.5
	#5815.0 #5817.5 #5820.0 #5822.5 #5825.0 #5827.5 #5830.0
	# 5832.5 # 5835.0 # 5837.5 # 5640.0 # 5842.5 # 5845.0 # 5847.5
	# 5850.0 # 5852.5 # 5855.0 # 5857.5 # 5860.0 # 5862.5 # 5865.0
	₹5867.5 ₹5870.0 ₹5872.5 ₹5875.0 ₹5877.5 ₹5880.0 ₹5882.5
	# 5885.0 # 5887.5 # 5890.0 # 5892.5 # 5895.0 # 5897.5 # 5900.0
	< 5902 5 < 5905 0 < 5907 5 < 5910 0 < 5912 5 < 5915 0 < 5917 5
	₹ 5920.0 ¥ 5922.5
	Select All 5.7 Clear A& Restore
Channel Bandwidth Scan	# 10 MHz # 15 MHz # 20 MHz # 30 MHz # 40 MHz
Cyclic Prefix :	One Sixteenth
AP Selection Method :	Power Level     Soptimize for Throughout
Color Code 1 :	0 (0254) / Priority Primary +
Installation Color Code :	* Enabled
Large Data Channel data Q	© Enabled

Additional Cold	or Codes	
Color Code		0 (0-254) / Priority Primary •
		Add/Modify Color Code Remove Color Code
Additional Cold	or Codes Table	
No additiona	i color codes configured	
MAC Control Pa	rameters	
MIMO Rate Adap	pt Algorithm	(MMOAS V)
Downlink Maxim	um Modulation Rate	(h y)
<b>Uplink Maximum</b>	Modulation Rate	lb 🗸
Nomadic Mode		Enabled
		• Disabled
Power Control	6	
External Gain	1	0 dBi (Range: 0 +40 dBi)
Enable Max Tx	Power :	@ Enable
clique mas in	i siisi i	* Disable
LQI Reference	EVM	
Reference Dow	inlink EVM :	0.0 dB
Current Downlin	nk EVM	-32.6 dB
Reference Upik	nk EVM	0.0 dB
Current Uplink	EVM:	-32.8 dB
Access Point M	IAC Address :	None
Channel Freque	ency .	None
Channel Bandy	width :	None
in a start a		Populate EVM
Advanced		
Decelos Duelle	(Dabus -	Chabled
Receive Guardy	/ Geoug	* Disabled
Attribute	Meaning	
Custom	Check the frequ	encies that SM has to scan for AP transmissions. See Radio Frequency
Radio	Scan Selection I	ist
Eroquoney		
scan		
Salaction		

Selection List				
Channel Bandwidth	The channel size used by the radio for RF transmission.			
Scan	9	Note Selecting multiple channel bandwidths will increase registration and re- registration times.		
Cyclic Prefix	The cyclic p	prefix for which AP scanning is executed.		
AP Selection Method	Operators r AP Selectio operation ir	nay configure the method by which a scanning SM selects an AP. By default, n Method is set to "Optimize for Throughput", which has been the mode of n releases prior to 12.0.3.1.		
	Power Leve	I: AP selection based solely on power level		

Attribute	Meaning				
	Note           For operation with a PMP 450m AP, select the Power Level option				
	or				
	Optimize for Throughput: AP selection based on throughput optimization – the selection decision is based on power level (which affects the modulation state), channel bandwidth (which affects throughput) and number of SM registrations to the AP (which affects system contention performance).				
Color Code 1	Color code allows you to force the SM to register to only a specific AP, even where the SM can communicate with multiple APs. For registration to occur, the color code of the SM and the AP must match. Specify a value from 0 to 254.				
	Color code is not a security feature. Instead, color code is a management feature, typically for assigning each sector a different color code. The default setting for the color code value is 0. This value matches only the color code of 0 (not all 255 color codes).				
	SMs may be configured with up to 20 color codes. These color codes can be tagged as Primary, Secondary, or Tertiary, or Disable. When the SM is scanning for APs, it will first attempt to register to an AP that matches one of the SM's primary color codes. Failing that, the SM will continue scanning and attempt to register to an AP that matches one of the SM's secondary color codes. Failing that, the SM will continue scanning and attempt to register to an AP that matches one of the SM's tertiary color codes. This is all done in the scanning mode of the SM and will repeat until a registration has occurred.				
	Color codes in the same priority group are treated equally. For example, all APs matching one of the SM's primary color codes are analyzed equally. Likewise, this evaluation is done for the secondary and tertiary groups in order. The analysis for selecting an AP within a priority group is based on various inputs, including signal strength and number of SMs already registered to each AP.				
	The first color code in the configuration is the pre-Release 9.5 color code. Thus, it is always a primary color code for legacy reasons.				
	The color codes can be disabled, with the exception of the first color code.				
Installation Color Code	With this feature enabled on the AP and SM, operators may install and remotely configure SMs without having to configure matching color codes between the modules. When using the Installation Color Code feature, ensure that the SM is configured with the factory default Color Code configuration (Color Code 1 is "O", Color Code 2-10 set to "O" and "Disable"). The status of the Installation Color Code can be viewed on the AP Eval web GUI page, and when the SM is registered using the Installation Color Code the message "SM is registered via ICC – Bridging Disabled!" is displayed in red on every SM GUI page. The Installation Color Code parameter is configurable without a radio reboot for both the AP and SM.				
Large Data Channel data Q	SM and BH have a configurable option used to prevent packet loss in the uplink due to bursting IP traffic. This is designed for IP burst traffic particular to video surveillance applications.				

Attribute	Meaning		
Color Code	The Color Code parameter in the Additional Color Codes section allows additional primary, secondary or tertiary color codes to be configured or disabled on the SM. Refer to Color Code 1 above for full details.		
MIMO Rate Adapt Algorithm	This pull-down menu helps in configuring the Rate Adapt Algorithm to MIMO-A/B, MIMO-B only, or MIMO-A only.		
Downlink Maximum Modulation Rate	This pull-down menu helps in configuring the Downlink Maximum Modulation Rate at a configurable rate of 1X, 2X, 3X, 4X, 6X, or 8X. The default value is "8X".		
Uplink Maximum Modulation Rate	This pull-down menu helps in configuring the Uplink Maximum Modulation Rate at a configurable rate of 1X, 2X, 3X, 4X, 6X, or 8X. The default value is "8X".		
Nomadic Mode	Allows the movement of SMs within a sector. A feature key is required to enable this feature at the AP. This mode must also be enabled for the subset of SMs that an operator wishes to use with this mode.		
External	This value represents the antenna gain.		
Gain	For ODUs with integrated antenna, this is set at the correct value in the factory.		
	For Connectorized ODUs with external antenna, the user must set this value to the overall antenna gain, including any RF cable loss between the ODU and the antenna.		
Enable Max Tx Power	This field allows to enable or disable maximum transmission power.		
Reference Downlink EVM	This parameter records the reference downlink EVM (Error Vector Maginitude). This value is used to calculate the downlink LQI when the AP is configured to use the EVM-based Link Quality Metric.		
	The reference value can be entered manually by the user or set to the current measured value by clicking the Populate EVM button.		
Current Downlink EVM	Displays the current measured downlink EVM.		
Reference Uplink EVM	This parameter records the reference uplink EVM. This value is used to calculate the uplink LQI when the AP is configured to use the EVM-based Link Quality Metric.		
	The reference value can be entered manually by the user or set to the current measured value by clicking the Populate EVM button.		
Current Uplink EVM	Displays the current measured uplink EVM (Error Vector Magnitude).		
Access Point MAC Address	Displays the MAC address of the AP that the SM was registered to when the Reference Downlink EVM and Reference Uplink EVM values were set.		

Attribute	Meaning				
Channel Frequency	Displays the channel frequency that the SM was using when the Reference EVM values were set.				
Channel Bandwidth	Displays the channel bandwidth that the SM was using when the Reference EVM values were set.				
Receive Quality Debug	To aid in link performance monitoring, the AP and SM now report the number of fragments received per modulation (i.e. QPSK, 8-QAM, 16-QAM, 32 -QAM, 64-QAM and 128-QAM) and per channel (polarization).				
	Note Due to CPU load, this will slightly degrade packet per second processing.				



#### Note

The frequencies that a user can select are controlled by the country or a region and the Channel Bandwidth selected. There can be a case where a user adds a custom frequency (from the Custom Frequencies page on page Custom Frequencies page ) and cannot see it in the pull down menu.

### Radio page - PMP 450i SM 3 GHz

The Radio tab of the PMP 450i SM 3 GHz is shown in below table.

Table 49: PMP 450i SM Radio attributes - 3 GHz

Radio Configuration							
	3.5/3.6 GHz						
	✓ 3310.000  ≤ 3320.000  ≤ 3330.000  ≤ 3340.000  ≤ 3350.000						
	₩ 3360.000 ₩ 3370.000 ₩ 3380.000 ₩ 3390.000 ₩ 3400.000						
	≥ 3410.000 ≥ 3420.000 ≥ 3430.000 ≥ 3440.000 ≥ 3450.000						
	₹ 3460.000 ₹ 3470.000 ₹ 3480.000 ₹ 3490.000 ₹ 3500.000						
	₹ 3510.000 ₹ 3520.000 ₹ 3530.000 ₹ 3540.000 ₹ 3550.000						
	R 3560.000 R 3570.000 R 3580.000 R 3590.000 R 3600.000						
Custom Radio Frequency Scan Selection Lis	1: E3610.000 E3620.000 E3630.000 E3640.000 E3650.000						
	E 3550 000 E 3570 000 E 3590 000 E 3590 000						
	≈ 3660.000 ≈ 3670.000 ≈ 3660.000 ≈ 3630.000						
	5 MHz only						
	K#7 MHz						
	ce 10 MHz						
	<= 15 MHz						
	6×20 MHz						
	ce 30 MHZ Not available in this series						
	Select All Clear All Restore						
	# 5 MHz						
	🗷 7 MHz						
Channel Bandwidth Scan :							
	20 MHz						
	R 30 MHZ						
Cuello Drofix I	≤ 40 MHZ						
Cyclic Prenx :	One sixteenth     One sixteenth						
AP Selection Method :	Optimize for Throughout						
Color Code 1 :	0 (0-254) / Priority Primary *						
Installation Onlan Onda :	* Enabled						
Installation Color Code :	Disabled						
Large Data Channel data O	Enabled						
carge base offerner date to .	Disabled						
Additional Color Codos							
Color Code :	0 (0-254) / Princity Primary						
CONTROLOGY	AddModify Color Code Remove Color Code						
	realized over the first over						
Additional Color Codes Table							

No additional color codes configured

MAC Control Parameters					
MMO Rate Adapt Algorithm	MNCTA A				
Downlive Maximum Modulation Rate	li v				
Uplink Maximum Modulation Rate	EV.				
Nomadic Mode	Enabled Doubled				
Power Control					
External Gain	(0 dBi (Range: 0 +70 dBi)				
Enable Max Tx Power	# Enable # Disable				
LQI Reference EVM					
Reference Downlink EVM	0.0 dB				
Current Downlink EVM	-35.3 dB				
Reference Uplink EVM	8b 00				
Current Uplink EVM :	-32.3 d8				
Access Point MAC Address	None				
Channel Frequency	None				
Channel Bandwidth	None				
en ec el l'estat che anc	Populate EVM				
Advanced	Constant and the second s				
Receive Quality Debug !	© Enabled				



## Note

Refer PMP 450i SM Radio attributes - 5 GHz for parameter details.

## Radio page - PTP 450i BHM 5 GHz

The Radio page of PTP 450i BHM is explained in below table.

Table 50: PTP 450i BHM Radio page a	attributes -	- 5	GHz
-------------------------------------	--------------	-----	-----

Device Type							
Jink Mode	Backhaul     Old depint						
Rent Alerty	Tashy Master						
Timing Mode	Timing Slave						
Nonservice Marine Internet	0.000						
Financial Gard	AT CRIME IN						
Frequency Carder	AARD C - Current	Active Freedom	new.				
Channel Bandaitth	151442	- tour - tour and the					
Frame Parint	O 5 0 ms						
	• 2.5 ma						
CYCRE PROIX	One Stoteenth						
Calar Code	111 (0254)	1. T					
Sactor ID	(II.¥)						
Large Data Channel data Q :	Enabled						
TTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT				_	_		
Investored Faranceles							
Disartish Maximum Madulation Date	and a						
Jales Maximum Modulation Rate							
	IL W Bridging of	I be doubled if	The second secon				
No. of the second	this setting						
Nonement Microsoften Hate	this setting		the same in	in the second second	0.0000		
Finance Construction	this setting				13 04000		
Frame Configuration	this vetting	18-16 Ni					
Research Neocurron Have -	this setting	11-16 %)					
Russes Configuration Downlink Data	this setting	2.1836%)					
Romen Configuration Downlink Data Environ Control Transmit Power	this setting	x 18 → 85 %) ange: -30 → +2	17 dDmi (17 dD	m V/17 d3m	H)		
France Componition Downlink Data State Common Transmit Power External Gain	50 % (Range 20 dBm (R 3 dBm (R	r: 15 → 85 %) ange: -30 → +2 nge: 0 → +40 d	17 dDmi (17 dB Bij	m V / 17 dün	н)		
France Consideration Downlink Data Foreign Control Transmit Power External Gale BHS-TX Power Control	25 office (Range 25 office (Range 25 office (Range 25 office (Range 25 office (Range	ange: -30+2 nge: -30+2 controls)	(7 dBm; (17 dB Bij	m V / 17 düm	H)		
Annum Modulation Have Annum Componition Downlink Data Power Control Transmit Power External Gale BHS Tax Power Control BHS Tax also Tamat Laval	this setting 20 % (Range 20 dBm (R 2 dB) (Re Chabled (Brid) © Chabled (Brid) © Chabled (Brid)	2. 15 36 %) ange: -30 +2 nge: 0 +40 d Controls) ange: -404	17 dDm3 (17 dB Bi) ID dRm3	m V / 17 dün	H)		
Annene Conspondion Downlink Data Forest Control Transist Power External Gals BHS TX: Power Control BHS Receive Target Level	bis setting 50 1% (Range 20 dBm (R 8 dBi) (Rs Chabield (BHM) 8 Disabled 82 dBm (R	ange: -36 %) ange: -30 +2 rige: 0 +40 d Controls) ange: -404	7 dBm; (17 dB Bi) 12 dBm)	m V / 17 dGm	H)		
Animum Moodation Hare Downlink Data Enter Rowart External Gale BHS TX: Power Control BHS Receive Target Level Addated N	this setting 50 1% (Range 20 dBm (R 8 dBl (Re Enabled (BHM) • Draabled 40 dBm (R	e 15 - 36 %) ange -30 - +2 rige 0 - +40 d Controls) lange -40 - 4	17 dDm; (17 db Bi) Hi dBm)	m V / 17 dGm	H)		
Annual Conspondent Development Development Transmit Power External Gals BHS TX: Power Control BHS Receive Target Level Addressed Receive Cavality Debug	this setting 50 1% (Range 20 dBm (R 8 dBi (Rs Chabled (BHM) 8 Disabled 82 dBm (R Chabled 8 Disabled	e 15 - 36 %) ange -30 - +2 nge 0 - +40 d Controls) ange -40 - 4	17 dDm; (17 dB Bi) 12 dBm)	m V / 17 dQm	H)		
Research Modulation Have Research Consideration Downlink Data Research Power External Gale BHS Tak Power Control BHS Reserve Target Level Microsoft Receive Quality Debug	this setting 20 % (Range 20 dBm (R 2 dBm (R)	2 15 36 %) ange -30 +2 nge 0 +40 d Controls) ange -40 4	17 dBmi (17 dB Bi) 10 dBm)	m V / 17 dGm.	H) :.		
Annue Componition Downlink Data Transmit Power External Gain BHS-Tit Power Control BHS Receive Target Level Addances M Receive Clusity Debug	this setting 50 % (Range 25 dBr (R 2 dBr (R))))))))))))))))))))))))))))))))))))	: 15 85 %) ange: -30 +2 nge: 0 +40 d Controls) ange: -604	17 dðins (17 dð Bi) 18 dBinj	m V / 17 dGm.	H) 1.		
Anene Configuration Downlink Data Transist Power External Gain BHS-TX: Power Control BHS-TX: Power Control BHS-TA: Power Control BHS Receive Target Level Addresson Receive Chuality Debug	this setting 20 % (Range 20 dBm (R 2 dBm (R) dBm (R 2 dBm (R) dBm (R 2 dBm (R)	2 15 36 %) ange - 30 +2 rige 0 +40 d Controls) ange - 40 4 Ande setting tro	17 dBm; (17 dB Bi) 10 dBm) m the table bei	m V / 17 dGan. Ine tanael on c	H) .		
Anismum Moodanon Hare Downlink Data Entern Control External Gale BHS Tac Power Control BHS Tacative Target Level Altonocol M Receive Quality Debug	bis setting 50 5 (Range 25 dBm (R 8 dBl (Rs Crabled (Bis) 0 Disabled 22 dBm (R 22 dBm (R) (R 22 dBm (R) (R 22 dBm (R) (R 22 dBm (R)	2 15 - 55 %) ange -50 - +2 nge 0 - +40 d Controls) ange -604	17 dBm; (17 dB Bi) 10 dBm; 11 dBm; 12	m V / 17 dGan. Inv based on t	H) :		
Animum Moodanion Have Deventing Componition II Deventing Data Enternal Gale BHS Tax Power Control BHS Receive Target Level Addresson Receive Quality Debug	bis setting 50 5 (Range 25 dBm (R 2 dBi (R) dB) (R 2 dBi (R) dB) (R 2 dB) (R) (R) (R) (R) (R) (R) (R) (R) (R) (R	15 - 36 %) ange - 50 - +2 nge 0 - +40 d Controls) ange - 40 4 Adde setting true estatem and agrin 13 # 1 w	(7 dBm; (17 dB Bi) 10 dBm) m the table bei c tource 172 5 to	m V/ 17 dDm ov based on 1 12 5 to 13 4	H)		
Rosentern Moodunton Have Rosentern Moodunton Have Rosentern Deter Rosentern Detern De	bis setting 50 5 (Range 20 dbm (R 8 dbl (RH Enabled dBH 82 dBm (R 22 dBm (R 23 dBm (R 24 dBm (R 24 dBm (R 25 dBm (R 25 dBm (R 25 dBm (R 25 dBm (R 26 dBm (R))))))))))))))))))))))))))))))))))))	ange: -30 +2 npe: 0 +40 d Controls) lange: -404 Ande setting tru solution and syn 13.4.1 se higher	17 dDm; (17 dD di) 18 dBm) 19 dBm) 10 dBm) 10 dBm) 10 dBm) 12 dDm 12 dDm 12 dDm 12 dDm 12 dDm 12 dDm 12 dDm; (17 dD dDm; (17 dD) 17 dDm; (17 dD) 18 dDm; (17 dD) 19 dD; (17 dD) 19 d	m V/ 17 dBm ne based on t 12.5 to 13.4 (DFS all)	H)		
Annual Composition II Deventing Data Transmit Power External Gale BHS Tic Power Control BHS Receive Target Level Advanced Receive Chailty Debug Frame Alignment Legacy Mode	bis setting 50 5 (Range 20 dBrn (R 2 dBrn (R))))))))))))))))))))))))))))))))))))	ange: -30 +2 npe: 0 +40 d Controls) lange: -404 Ande setting tru extern and syn 13.4.1 ur higher CFF	17 dDm; (17 dD di) 18 dBm; 18 dBm; 19 dBm; 10	m V/17 dBm ne based on t 12.6 to 13.4 OF5 alf) OFF	H) I H) I H) I H) I H) I H) I H) I H) I		
Annue Conspondent Deursteite Data Transest Power External Gale BHS-TX: Power Control BHS-TX: Power Control BHS-TA: Power Control BHS	bis setting 50 % (Range 20 dBm (R 8 dBl (Rs Enabled 50 dBm (R 50 dBm (R 50 dBm (R 50 dBm (R 50 dBm (R 50 dBm (R 51 dBm (R) 51 dBm (R 51 dBm (R) 51	Ander setting for solution and sur- solution and	17 dBm) (17 dB Bi) 12 dBm) 12 dBm)	m V / 17 dBm na based on t 13 6 to 13 4 (OFS all) OFF OH (Weds	H) H		

Attribute	Meaning			
Link Mode	For point-to-point operation (PTP), select Backhaul.			
	For point-to-multipoint operation (PMP), select Multipoint.			
Timing Mode	For backhaul master (BHM), select Timing Master.			
	For backhaul slave (BHS), select Timing Slave.			
Frequency Band	Select the operating frequency band of the radio. The supported bands are 4.9 GHz, 5.4 GHz and 5.7 GHz.			
Frequency Carrier	Specify the frequency for the module to transmit. The default for this parameter is None. For a list of channels in the band, see the drop-down list on the radio GUI.			
Channel Bandwidth	The channel size used by the radio for RF transmission. The setting for the channel bandwidth must match between the BHM and the BHS.			

Attribute	Meaning				
Frame Period	Select the Frame Period of the radio. The supported Frame Periods are: 5 ms and 2.5 ms.				
Cyclic Prefix	OFDM technology uses a cyclic prefix, where a portion of the end of a symbol (slot) is repeated at the beginning of the symbol to allow multi-pathing to settle before receiving the desired data. A 1/16 cyclic prefix means that for every 16 bits of throughput data transmitted, an additional bit is used.				
Color Code	Specify a value from 0 to 254. For registration to occur, the color code of the BHM and the BHS must match. Color code is not a security feature. Instead, color code is a management feature, typically for assigning each link a different color code.				
	Color code allows you to force a BHS to register to only a specific BHM. The default setting for the color code value is 0. This value matches only the color code of 0 (not all 255 color codes).				
Sector ID	This pull-down menu helps in configuring the Sector ID at a configurable value from 0 to 15.				
Large Data Channel data Q	Enable Large Data Channel data Q for applications that burst data high rates. Large Qs may decrease effective throughput for TCP application. Disable Large Data Channel data Q if application need not handle bursts of data. Large Qs may decrease effective throughput for TCP application.				
MIMO Rate Adapt Algorithm	This pull-down menu helps in configuring the Rate Adapt Algorithm to MIMO-A/B, MIMO-B only, or MIMO-A only.				
Downlink Maximum Modulation Rate	This pull-down menu helps in configuring the Downlink Maximum Modulation Rate at a configurable rate of 1X, 2X, 3X, 4X, 5X, 6X, 7X or 8X. The default value is "8X". The Rate Adapt Algorithm does not allow the modulation to go beyond this limit.				
Uplink Maximum Modulation Rate	This pull-down menu helps in configuring the Uplink Maximum Modulation Rate at a configurable rate of 1X, 2X, 3X, 4X, 5X, 6X, 7X or 8X. The default value is "8X". The Rate Adapt Algorithm does not allow the modulation to go beyond this limit.				
Minimum Modulation Rate	This pull-down menu helps in configuring the Minimum Modulation Rate at a configurable rate of 1X, 2X, 3X, 4X, 5X, 6X, 7X or 8X. The default value is "1X". If the Rate Adapt Algorithm is below this limit, then bridging is disabled. This is used if PTP network can route the traffic through another path.				
Nomadic Mode	Enabling of nomadic mode allows movement of SM's within a sector. A feature key is required to enable this at the AP. This mode must also be enabled for the subset of SM's that an operator wishes to use with this mode.				
Downlink Data	Specify the percentage of the aggregate throughput for the downlink (frames transmitted from the BHM to the subscriber). For example, if the aggregate (uplink and downlink total) throughput on the BHM is 132 Mbps, then 75% specified for this parameter allocates 99 Mbps for the downlink and 33 Mbps for the uplink. The default for this parameter is 50%. This parameter must be set in the range of 15% - 85%, otherwise the invalid input will not be accepted and the previously-entered valid setting is used.				

Attribute	Meaning				
	Note In order to prevent self-interference, the frame configuration needs to align. This includes Downlink Data, Max Range and Contention slots.				
Transmit	This value represents the combined power of the BHM's two transmitters.				
Power	Nations and regions may regulate transmit power. For example				
	<ul> <li>PTP 450i Series modules are available as connectorized radios, which require the operator to adjust power to ensure regulatory compliance.</li> </ul>				
	The professional installer of the equipment has the responsibility to:				
	<ul> <li>Maintain awareness of applicable regulations.</li> </ul>				
	Calculate the permissible transmitter output power for the module.				
	<ul> <li>Confirm that the initial power setting is compliant with national or regional regulations.</li> </ul>				
	Confirm that the power setting is compliant following any reset of the module to factory defaults.				
External Gain	This value needs to correspond to the published gain of the antenna used to ensure the radio will meet regulatory requirements.				
BHS TX	When enabled, BHM controls the transmit power of BHS.				
Power Control	When Disabled, BHS tranmit power is independent of BHM.				
BHS Receive Target Level	The BHM monitors the received power from BHS, and adjusts each BHS's Transmitter Output Power so that the received power at the BHM from that BHS is not greater what is set in this field. This value represents the transmitted and received power (combined power) perceived on the BHS.				
Receive Quality Debug	To aid in link performance monitoring, the BHM and BHS now report the number of fragments received per modulation (i.e. QPSK, 16-QAM, 64-QAM and 256-QAM) and per channel (polarization).				
	Note           Due to CPU load, this slightly degrades the packet during per second processing.				
Frame Alignment Legacy Mode	See PMP/PTP 450i Series - Configuring Radio				

## Radio page - PTP 450i BHS 5 GHz

The Radio page of PTP 450i BHS is explained in below table.

Table 51: PTP 450i BHS Radio attributes - 5 GHz

Device Type							
Link Mode :	# Backhai	18					
	Timipo I	Escier					
Timing Mode	# Taming 3	save					
tadio Configuration.							
	40.014						
	4.9 GR	Z:					
	No custom	frequencie	s present.				
		192	<u>.</u>				
	5104	¥					
	0.100	2					
	6152,5	5155.0	0157.5	2 6160.0	< 5162.5	2 5165.0	10167 5
	# 5170.0	#5172.5	# 5175.0	# 6177.5	₹ 5180.0	# 5182.5	# 5185.0
	# 5187.5	H 5190.0	₹ 5192.5	₹ 5195.0	# 5197.5	₩ 5200.0	K 5202.5
	# 5205.0	€ 5207.5	# 5210.0	# 5212.5	¥ 5215 0	# 8217.5	# 5220.0
	# 5222.5	R 5225.0	# 5227.5	W 5230.0	₹ 5232 5	+ 5235 0	× 5257.5
	2.5240.0	0 5242.5	8245.0	4247.5			
	5.2 GH	z					
				_	_	_	-
	5252.5	5255.0	5257.5	1.0360.0	< 5262.5	C:0265.0	2 8267.4
	# 5270.0	H 5272.5	# 5275.0	# 5277.5	₩ 5260-0	# 5282.5	# 5285.0
	¥ 5207.5	K 5290.0	# 5292.5	× 5295.0	× 5297.5	× 5000.0	# 5302.5
	# 5305.0	# 5307.5	# 5310.0	# 5312.5	# 5315.0	# 5917-5	# 5320 0
	# 2322.5	# 5325.0	# 5527.5	# 5330.0	5.2002.5	2 2235 0	P 0337.3
	2.3340.0	in poet o	2040.0	PC-SOME-B			
	5.4 GH	z					
		Sector Control of		and the second se	10000	Contraction Contractor	
	5472.5	5475.0	- 5477.5	₹ 5460 D	× 5482.5	2 5485 1	- 5487.5
	# 5490.0	# 5492.5	# 5495.0	# 5497.5	# 5500.0	# 5502.5	# 5505 0
	e 0507 5	₹ 5510.0	# 5512.5	# 9615.0	# 6617.6	# 0020.0	# 0522 S
	* 5525.0	# 5527.5	# 5530.0	* 0032.5	= 2036.0	= 5637.5	# 5540.0
	# 0542.5	# 0545.0	# 9547.5	* 00000	# 0002.5	# 5555 0	# 00073
	# 1060.0	# 0002.0	# 0060.0	# 0007.0	# 0070.0	# 0072.5 # 5500.0	# 5502 C
Solom Radio Encouency Crass Calertino List	# 00// D	# 00000	# 0082,5	# 0000.0	- 0001 D	# 0090 0	- 0092 C
watern starte megaciner scan servicen car.	× 6090.0	- 0097.0 # 6016.0	2 5500.0	- 0602.0 90 66500.0	- 3000.0 9 4633 d	28626.0	- 0810.0
	# 5612.0	A 0010.0	# 4646.0	# 5620.0	# 0622.0	# 6640 E	# 0027.0
	# 5647 5	¥ 5650.0	# 5552 6	# 1655.0	¥ 5657 6	# 5660 0	2 5662 1
	# 5665 A	¥ 5867 5	# 5670.0	£ 5672 G	8 4675 0	2 4677 5	# 5685 /
	# 5682.5	# 5685 A	# 5687 5	W 5690.0	# 5692 5	# 5695 A	# 5697 4
	# 5700.0	8 5702 5	# 5705 0	9 \$707 6	- 5710 8	2 8712 8	- 5715 C
	57175	5720.0	6799.4	1			- Courters

	5.7 GHz						
	6727.5 8730.0 5732.5 46735.0 48737.5 48740.0 48742.5						
	#5745.0 #5747.5 #5750.0 #5752.5 #5755.0 #5757.5 #5760.0						
	#5762.5 #5765.0 #5767.5 #5770.0 #5772.5 #6775.0 #6777.5						
	#5780.0 #5782.5 #5785.0 #5787.5 #5790.0 #5792.5 #5795.0						
	#57975 #5800.0 #58025 #58050 #58075 #5810.0 #58125						
	#5815.0 #5817.5 #5820.0 #5822.5 #5825.0 #5827.5 #5850.0						
	# 5832.5 # 5835.0 # 5837.5 # 5840.0 # 5842.5 # 5845.0 # 5847.5						
	# 5850.0 # 5852.5 # 5855.0 # 5857.5 # 5860.0 # 5862.5 # 5865.0						
	# 5867.5 # 5870.0 # 5872.5 # 5575.0 # 5877.5 # 5880.0 # 5882.5						
	# 5885 0 # 5887 5 # 5890 0 # 5892 5 # 5895 0 # 5897 5 # 5900 0						
	# 5902.5 # 5905.0 # 5907.5 # 5910.0 # 5912.5 # 5915.0 0 5917.5						
	5920.0 5922.5						
	sin 201 NOH2 mix 305 NOH2 Had accelation in this regard						
	Delect AE Select ALS.8 Select ALS.1 Select ALS.2 Select ALS.4						
	Select All 5.7 Clear All Rectory						
	# 5 MHz						
	# 10 MHz						
Channel Bandwidth Scan :	# 20 MHz						
	# 30 MHz						
	# 40 MHz						
Cyclic Prefix	One Skiteenth						
Color Code							
Large Data Channel data Q :	Enabled     Disabled						

MAC Control Parameters		E
MIMO Rate Adapt Algorithm :	MIMO-A	·B •
Downlink Maximum Modulation Rate :	8x *	
Uplink Maximum Modulation Rate :	8x *	
Minimum Modulation Rate :	4x • B setting	indging will be disabled if the transmit modulation rate is below this
Power Control		E
Transmit Power :	-17	dBm (Range: -30 - +27 dBm) (-20 dBm V / -20 dBm H)
External Gain :	0	dBi (Range: 0 — +40 dBi)
LQI Reference EVM		Ξ.
Reference Downlink EVM :	0.0	dB
Current Downlink EVM :	-32.2 d	8
Reference Uplink EVM :	0.0	dB
Current Linlink EVM :	31.4.4	8

Guitent Opink EVM.	-01.40	10
Access Point MAC Address :	None	
Channel Frequency :	None	
Channel Bandwidth :	None	
		Populate EVM

Advanced III					
Receive Quality Debug :	Enabled     Bisabled				

Attribute	Meaning	
Link Mode	For point-to-point operation (PTP), select Backhaul.	
	For point-to-multipoint operation (PMP), select Multipoint.	

Attribute	Meaning				
Timing Mode	For backhaul master (BHM), select Timing Master.				
	For backhaul slave (BHS), select Timing Slave.				
Custom Radio Frequency Scan Selection List	Check any frequency that you want the BHS to scan for BHM transmissions. See Radio Frequency Scan Selection List				
Channel	The channel size used by the radio for RF transmission.				
Scan	Note           Selecting multiple channel bandwidths will increase registration and re-registration times.				
Cyclic Prefix	The cyclic prefix for which BHM scanning is executed.				
Color Code	Color code allows to force the BHS to register to only a specific BHM, even where the BHS can communicate with multiple BHMs. For registration to occur, the color code of the BHS and the BHM must match. Specify a value from 0 to 254.				
	Only one color code can be configured on the BHS.				
Large Data Channel data Q	BHM and BHS have a configurable option used to prevent packet loss in the uplink due to bursting IP traffic. This is designed for IP burst traffic particular to video surveillance applications.				
MIMO Rate Adapt Algorithm	This pull-down menu helps in configuring the Rate Adapt Algorithm to MIMO-A/B, MIMO-B only, or MIMO-A only.				
Downlink Maximum Modulation Rate	This pull-down menu helps in configuring the Downlink Maximum Modulation Rate at a configurable rate of 1X, 2X, 3X, 4X, 5X, 6X, 7X or 8X. The default value is "8X". The Rate Adapt Algorithm does not allow the modulation to go beyond this limit.				
Uplink Maximum Modulation Rate	This pull-down menu helps in configuring the Uplink Maximum Modulation Rate at a configurable rate of 1X, 2X, 3X, 4X, 5X, 6X, 7X or 8X. The default value is "8X". The Rate Adapt Algorithm does not allow the modulation to go beyond this limit.				
Minimum Modulation Rate	This pull-down menu helps in configuring the Minimum Modulation Rate at a configurable rate of 1X, 2X, 3X, 4X, 5X, 6X, 7X or 8X. The default value is "1X". If the Rate Adapt Algorithm is below this limit, then bridging is disabled. This is used if PTP network can route the traffic through another path.				
Nomadic Mode	Allows the movement of SMs within a sector. A feature key is required to enable this feature at the AP. This mode must also be enabled for the subset of SMs that an operator wishes to use with this mode.				

Attribute	Meaning
Transmit Power	Refer PTP 450i BHM Radio page attributes – 5 GHz
External Gain	
Reference Downlink EVM	
Current Downlink EVM	Refer PMP 450i SM Radio attributes - 5 GHz
Reference Uplink EVM	
Current Uplink EVM	
Access Point MAC Address	
Channel Frequency	
Channel Bandwidth	
Receive Quality Debug	To aid in link performance monitoring, the BHM and BHS now report the number of fragments received per modulation (i.e. QPSK, 16-QAM, 64-QAM and 256-QAM) and per channel (polarization).

## PMP/PTP 450b Series - configuring radio

Radio page - PMP/PTP 450b Mid-Gain/High Gain and Retro SM 5 GHz

The Radio page of PMP/PTP 450b Mid-Gain/High Gain and Retro SM is explained in below table.

Table 52: PMP/PTP 450b Mid-Gain/High Gain and Retro SM Radio attributes - 5 GHz

Device Type	T MANAGEM AN	
LINK Mode	Backhaul	
	* Multpoint	
Radio Configuration		
	4.9 GHZ	
	No custom frequencies present.	
	5.1 GHz	
	×51525 251550 ×51575 ×51600 ×51525 ×51660 ×	5167.5
	#5170.0 #51725 #5175.0 #51775 #5180.0 #51825 #	5185.0
	#5187.5 #5190.0 #5192.5 #5195.0 #5197.5 #5200.0 #	5202.5
	# 5205.0 # 5207.5 # 5210.0 # 5212.5 # 5215.0 # 5217.5 #	5220.0
	# 5222.5 # 5225.0 # 5227.5 # 5230.0 # 5220.5 # 5238.0 ¥	8237.5
	€5240.0 × 5242.5 €5245.0 × 5247.5	
	5 3 Old	
	5.2 GH2	
	* 5252.5 * 5255.0 * 5257.5 * 5260.0 * 5262.5 * 6266.0 *	6267.5
	# 5270.0 # 5272.5 # 5275.0 # 5277.5 # 5280.0 # 5282.5 #	5285.0
	# 5267.5 # 5290.0 # 5292.5 # 5295.0 # 5297.5 # 5300.0 #	5302.5
	# 5305.0 # 5307.5 # 5310.0 # 5312.5 # 5315.0 # 5317.5 #	5320.0
	# 5322 5 # 5325 0 # 5327 5 # 5330 0 # 6332 5 # 6336.0 #	5337.5
	< 5340.0 × 5342.5 × 6345.0 × 5347.5	
	5.4 GHz	
	# 5472.5 # 5475.0 # 5477.5 # 5400.0 # 5482.5 # 5485.0 P	5487.5
	# 5490.0 # 5492.5 # 5495.0 # 5497.5 # 5500.0 # 6602.5 #	5505.0
	#5507.5 #5510.0 #5512.5 #5515.0 #5517.5 #5520.0 #	1522.5
	₹55250 ₹55275 ₹56300 ₹55325 ₹55350 ₹56375 ₹	6540.0
	# 5542.5 # 5545.0 # 5647.5 # 5550.0 # 5552.5 # 5558.0 #	0557.5
	#5560.0 #5562.5 #5565.0 #5567.5 #5570.0 #5572.5 #	5575.0
	#5577.5 #5580.0 #5582.5 #5585.0 #5587.5 #5590.0 #	5592.5
Custom Radio Frequency Scan Selection List	#5595.0 #5597.5 #5600.0 #5602.5 #5605.0 #5607.5 #	5610.0
	# 5612.5 # 5615.0 # 5617.5 # 5620.0 # 5622.5 # 5625.0 #	5627.5
	# 5630.0 # 5632.5 # 5635.0 # 5637.5 # 5640.0 # 9642.5 #	5645.0
	# 5547.5 # 5550.0 # 3652.5 # 5655.0 # 5657.5 # 3660.0 #	5662.5
	¥5665.0 ¥5667.5 ¥5670.0 ¥5672.5 ¥5675.0 ¥5677.5 ¥	0.0880
	# 5682.5 # 5685.0 # 5687.5 # 5690.0 # 5692.5 # 5695.0 #	5697.5
	# 5700.0 # 5702.5 # 5705.0 # 5707.5 # 5710.0 # 5712.5 #	5715.0
	# 5717 5 # 5720.0 # 5722.5	

Cales Code	A 10. 15.0 ( Details) Borner		
COLOF CODE	0 (U-204) / Priority Primary *		
	AddModity Color Code   Remove Calor Code		
A LOS on of Parker Product Table			
Modelonal color codes california			
No additional color cours consylines			
MAC Centrol Parameters			
MM/O Rate Adapt Algorithm	(MMCAB V)		
Downlink Maximum Modulation Rate			
Uplink Maximum Modulation Rate	b Y		
Nomario Mode	Enabled		
Lonitories director	© Disabled		
Power Control			
External Gain Fixed :	23 (6)		
Formation before The Discusses :	0 Enable		
Enable Mak 1X Power	* Disable		
LQI Reference EVM			
Reference Downlink EVM	0.0 dB		
Current Downlink EVM	-32.5 dB		
Reference Uplink EVM	0.0 dB		
Current Uplink EVM	-33.0 dB		
Access Point MAC Address	None		
Channel Frequency	None		
Channel Bandwidth	None		
	Populate EVM		

Advanced		
Receive Quality Debug	<ul> <li>Enabled</li> <li>Disabled</li> </ul>	

Attribute	Meaning
Link Mode	Refer Radio page - PTP 450 i BHS 5 GHz for
Custom Radio Frequency Scan Selection List	parameter description.
Channel Bandwidth Scan	
Cyclic Prefix Scan	
AP Selection Method	
Color Code 1	
Installation Color Code	
Large Data Channel data Q	
Color Code	
MIMO Rate Adapt Algorithm	
Downlink Maximum Modulation Rate	
Uplink Maximum Modulation Rate	
Nomadic Mode	
External Gain Fixed	
Enable Max Tx Power	
Reference Downlink EVM	
Current Downlink EVM	
Reference Uplink EVM	
Current Uplink EVM	
Access Point MAC Address	
Channel Frequency	
Channel Bandwidth	
Receive Quality Debug	

# PMP 450b6 Series - configuring radio

Radio page - PMP 450b6 High Gain 6 GHz

The Radio page of PMP 450b6 High Gain SM is explained in below table.

#### Figure 36: PMP 450b High Gain SM Radio attributes - 6 GHz

Device Typ	10										
Link Mode :		<ul> <li>Backhi</li> <li>Multipo</li> </ul>	Backhaul     Multimate								
Radio Con	figuration	hanner									
Radio Freq	uency Scat	n Belection	£.161 -								
	3										
b./ GH	Z										
0.5727.5	5730:0	05732.5	06735.0	05737.5	5740.0	0.5742.5	5745.0	5747.5	5750.0	0.5752.5	0.5755.0
0 5757.5	5700.0	05762.5	5765.0	0 5767.5	5770.0	05772.5	0 5775.0	05777.5	0.5780.0	0 5782.5	05785.0
5787.5	0.5790.0	05792.5	05795.0	5797.5	15800.0	5802.5	135805.0	□5807.5	0.6810.0	□5812.5	35815.0
5817.5	□ 5820.0	5822.5	0.5825.0	0 5827.5	□ 5630.0	0 5832.5	(15835.0	5837.5	0.5840.0	05842.5	0 5845.0
5847.5	0.5850.0	0.5852.5	5855.0	5857.5	05860.0	5862.5	0.5885.0	15867.5	0 5870.0	5872.5	35875.0
0 5877.5	0.0888.0	05882.5	15885.0	0.6887.5	13890.0	0 5892.5	5895.0	5897.5	0.0000	□ 5902.5	3905.0
5907.5	□5910.0	5912.5	0 5915.0	0 5917.5	○ 5920:0	□ 5922.5					
6 GHz	J-NII-5										
5927.5	0 5930.0	0 5932.5	0 5935.0	0 6937.5	0 5940.0	015942.5	35945.0	0 5947.5	C15950.0	0 5052.5	□ 5955.0
5957.5	0.5960.0	□ 5962.6	□ 5965.0	0 5967.5	5070.0	□ 5972.5	○ 5975.0	05977.5	0.6960.0	0 5982.5	5985.0
5987.5	5990.0	0 5992.5	0 5995.0	□ 5997.5	0,0008	0 6002.5	0 8005.0	06007.5	0,6010.0	0 6012.5	06015.0
0 6017.5	0.6029.0	06022.5	0.6025.0	06027.5	0 6030.0	06032.5	0 6035.0	6037.5	06040.0	6042.5	0 6045.0
06047.5	0.6050.0	06052.5	0.6055.0	06057.5	0.0000	0062.5	06065.0	06067.5	06070.0	0 6072.5	0 6075.0
0 6077.5	0.06080	0082.5	0 6085.0	0 6087.5	0.0000 []	0 6092.5	176095.0	06097.5	06100.0	06102.5	0105.0
08107.5	06110.0	06112.5	06115.0	06117.5	06120.0	06t22.5	06125.0	08127.5	06130.0	6132.5	06135.0
06137.5	06140.0	06142.5	06145.0	06147.5	00150.0	06152,5	06155.0	06157.5	06160.0	06162.5	06165.0
06167.5	06170.0	061725	6175.0	6177.5	6180.0	06182.5	06185.0	06187.5	06190.0	0 6192.5	0.6195.0
00197.5	06200.0	06202.5	06205.0	0 6207.5	06210.0	□6212.5	06215.0	06217.5	6220.0	□ 8222.5	0.6225.0
0 6227.5	0 6230.0	06232.5	6235.0	08237.5	0 6240.0	0 6242.5	0.6245.0	06247.5	06250.0	0 6252.5	0 6255.0
06257.5	6260.0	0 6262.5	6265.0	0 6267,5	06270.0	08272.5	0.0275.0	06277.5	0 6260.0	6282.5	06285.0
0 6287.5	06290.0	06292.5	06295.0	0.6297.5							

6 SUM a server		
wort alleig		
en 55 1642		
4216 1042		
4.20 MH2		
Not evaluable or this region		
Bold only available with Engineering Key		
Select All Select All 5.7 Select All 6.5 Clear All A	stare	
	G 5 MHz	
	C 7 MHz	
Channel Productly Scool	C TO MHZ	
Channel bandwidth Scari (	C 15 MHz	
	C 30 MHz	
	40 MHz	
	O One Quarter	
Cyclic Prefix Scan :	C One Eighth	
	One Sixteenth	
AP Selection Method -	O Power Level	
in surface mental.	<ul> <li>Optimize for Throughput</li> </ul>	
Color Code 1 :	100 (0-254) / Priority	
Installation Color Code :	Enabled	
manifestion and a second se	Disabled	
Large Data Channel data Q :	C Enabled	
	<ul> <li>Disability</li> </ul>	
Additional Color Codes		2
Color Code :	<ul> <li>(0-254) / Priority Primary +</li> </ul>	
	Add/Modely Color Code Remove Color Code	
(an anomalian come consider an		
MAC Control Parameters		
MIMO Rate Adapt Algorithm :	MINO ATI	
Downlink Maximum Modulation Rate	0x 🛩	
Uplink Maximum Modulation Rate :	DX +	
Down Step Size for Rate Adapt when Rx Zero Economics	t (Range 1-7 ticks)	
Deter Service Device D	Enabled	
Hate Adapt Per LUIU :	O Disabled	
Normatic Mode -	C Enabled	
Numara, muan .	Disabled	
Power Control	The second s	- E
External Gain Fixed	0 dBi	
Enable Max Tx Power :	Enable     Disable	
Cil Reference EVM		
Reference Downline EVM -	-84 dB	
Current Doenlink FVM	37.69	
Reference Unlink FVM -	32.0 dB	
Current Unlink #VM -	A 5 cll	
Access Point MAC Arbitrary	0a.00.36.80.348	
Channel Fracuency	6750.0 MHz	
Channel Bardwidth	40.0 MHz	
	Populare EVM	
	, Have balance as a second	
Advanced	O Factled	
Receive Quality Debug :	Disabled	

Attribute	Meaning			
Link Mode	Refer Radio page - PTP 450i BHS 5 GHz for parameter			
Custom Radio Frequency Scan Selection List	description.			
Channel Bandwidth Scan				
Cyclic Prefix Scan				
AP Selection Method				
Color Code 1				
Installation Color Code				
Large Data Channel data Q				
Color Code				
MIMO Rate Adapt Algorithm				
Downlink Maximum Modulation Rate				
Uplink Maximum Modulation Rate				
Down Step Size for Rate Adapt when Rx Zero Fragments				
Rate Adapt Per LUID				
Nomadic Mode	Refer Radio page - PTP 450i BHS 5 GHz for parameter			
External Gain Fixed	description.			
Enable Max Tx Power				
Reference Downlink EVM				
Current Downlink EVM				
Reference Uplink EVM				
Current Uplink EVM				
Access Point MAC Address				
Channel Frequency				
Channel Bandwidth				
Receive Quality Debug				

## Radio page - PMP/PTP 450b High Gain SM 3 GHz

The Radio page of PMP/PTP 450b High Gain SM is explained in below table.

Device Type			
Link Mode :	Backhaol     Authorize		
	+ seampoors		
Radio Configuration			
	3 5/3 6 GHz		
	# 3360 000 # 3370 000 # 3380 000 # 3390 000 # 3400 000		
	# 3410,000 # 3420,000 # 3430,000 # 3440,000 # 3450,000		
	# 3460 000 # 3470 000 # 3480 000 # 3490 000 # 3500 000		
	₹ 3510,000 ₹ 3520,000 ₹ 3530,000 ₹ 3540,000 ₹ 3550,000		
	# 3560 000 # 3570 000 # 3580 000 # 3590 000 # 3600 000		
Custom Radio Frequency Scan Selection List	# 3610,000 # 3620,000 # 3630,000 # 3640,000 # 3650,000		
	# 3655.000 # 3660.000 # 3670.000 # 3680.000 # 3690.000		
	8 MHz snity ++ 7 MHz ++ 15 MHz ++ 15 MHz ++ 20 MHz		
Channel Bandwidth Scan	# 5 MHz # 7 MHz # 10 MHz # 15 MHz # 20 MHz # 30 MHz # 40 MHz		
Cyclic Prefix :	One Sixteenth		
AP Selection Method	Power Level     Rodimize for Throughout		
Color Code 1 :	0 (0-254) / Priority Primary *		
Installation Color Code	* Enabled © Disabled		
Large Data Channel data Q	© Enabled * Disabled		

#### Table 53: PMP/PTP 450b High Gain SM Radio attributes - 3 GHz

Additional Color Codes		
Color Code	0 (0-254) / Priority Primary *	
	AddModily Color Code Remove Color Code	
Additional Color Codes Table		
No additional color codes configure	d	
MAC Central Parameters		
MIMO Rate Adapt Algorithm	(XHACAR V)	
Desentiek Maximum Modulation Rate	(b.w.	
Uplick Maximum Modulation Rate		
Nomadic Mode	Enabled     Descripted	
Power Control		
External Gain Fixed	20 081	
Enable Max Tx Power	@ Enable	
	* Disable	
LQI Reference EVM		
Reference Downlink EVM	0.0 dB	
Current Downlink EVM	-29.4 mB	
Reference Uplink EVM :	0.0 dB	
Current Uplink EVM	-35.1 dB	
Access Point MAC Address	None	
Channel Frequency	None	
Channel Bandwidth	None	
	Populate EVM	
Advanced		
Advanceu	Enthind	
Receive Quality Debug		

Attribute	Meaning
Link Mode	Refer PMP/PTP 450b Mid-Gain/High Gain and Retro SM Radio attributes – 5 GHz
Custom Radio Frequency Scan Selection List	
Channel Bandwidth Scan	
Cyclic Prefix	
AP Selection Method	
Color Code 1	
Installation Color Code	
Large Data Channel data Q	
Color Code	
MIMO Rate Adapt Algorithm	
Downlink Maximum Modulation Rate	
Uplink Maximum Modulation Rate	
Nomadic Mode	
External Gain Fixed	This value represents the fixed antenna gain. The fixed antenna gain for High Gain is +20 dBi.
	For ODUs with integrated antenna, this is set at the correct value in the factory.
	For Connectorized ODUs with external antenna, the user must set this value to the overall antenna gain, including any RF cable loss between the ODU and the antenna.
Enable Max Tx Power	Refer PMP/PTP 450b Mid-Gain/High Gain and Retro SM Radio attributes - 5 GHz
Attribute	Meaning
-----------------------------	---
Reference Downlink EVM	
Current Downlink EVM	
Reference Uplink EVM	
Current Uplink EVM	Refer PMP 450i SM Radio attributes - 5 GHz.
Access Point MAC Address	
Channel Frequency	
Channel Bandwidth	
Receive Quality Debug	

Radio page - PMP/PTP 450b Mid-Gain/High Gain BHM 5 GHz

The Radio page of the PMP/PTP 450b BHM is explained in below table.

#### Table 54: PMP/PTP 450b BHM Radio attributes - 5 GHz

Device Type						=
Link Mode :	Backhaul					
	© M	ultipoint				
Timing Mode :	Timing Master					
	U Ti	ning Slave				
Radio Configuration						
Frequency Band :	5.7 G	Hz 🔻				
Frequency Carrier :	None	*				
Channel Bandwidth :	10 M	Hz 🔹				
Frame Period :	05.0 82.5	0 ms 5 ms				
Cyclic Prefix :	One	Sixteenth				
Color Code :	0	(0-254)				
Sector ID :	0 •	1				
Large Data Channel data Q :	© En	abled				
MAC Control Parameters						E
MIMO Rate Adapt Algorithm :	MIMC	-A/B 🔻				
Downlink Maximum Modulation Rate :	8x *					
Uplink Maximum Modulation Rate :	8x *					
Minimum Modulation Rate :	Itx      Bridging will be disabled if the transmit modulation rate is below this setting					
Frame Configuration						
Downlink Data :	75	% (Range: 18	5 — 85 %)			
Power Control						B
Transmit Power :	16	dBm (Rang	e: -30 - +27 dB	m) (13 dBm)	V / 13 dBm H	0
External Gain Fixed :	16 dE	31		7.00		7
Advanced						E
Receive Quality Debug :	0 Er	abled				
	® Da	sabled				
	OFF	•				
	Choo	se Legacy Mod are revision an	e setting from th d sync source:	e table below	v based on co	plocated radio's
Frame Alignment Legacy Mode :	Sync	Src.\ SW Rev.	13.4.1 or higher	12.0 to 13.4 (DFS on)	12.0 to 13.4 (DFS off)	below 12.0
	Timir	ng Port	OFF	OFF	OFF	OFF
	Powe	er Port	OFF	OFF	ON (Mode 1	)OFF

Attribute	Meaning
Link Mode	See PTP 450i BHM Radio page attributes - 5 GHz
Timing Mode	

Attribute	Meaning
Frequency Band	See PMP 450m Series – configuring radio
Frequency Carrier	
Channel Bandwidth	
Frame Period	
Cyclic Prefix	
Color Code	
Sector ID	
Large Data Channel data Q	
MIMO Rate Adapt Algorithm	
Downlink Maximum Modulation Rate	
Uplink Maximum Modulation Rate	
Minimum Modulation Rate	
Nomadic Mode	
Downlink Data	
Transmitter Power	See PTP 450i BHM Radio page attributes - 5 GHz
External Gain Fixed	This value represents the fixed antenna gain. The fixed antenna gain for Mid-Gain is 16 dBi and High Gain is 23 dBi.
	For ODUs with integrated antenna, this is set at the correct value in the factory.
	For Connectorized ODUs with external antenna, the user must set this value to the overall antenna gain, including any RF cable loss between the ODU and the antenna.
Receive Quality Debug	See PTP 450i BHM Radio page attributes - 5 GHz
Frame Alignment Legacy Mode	See PMP/PTP 450i Series - Configuring Radio

# Radio page - PMP/PTP 450b Mid-Gain/High Gain BHS 5 GHz

The Radio page of PMP 450b BHS is explained in the below table.

Table 55: PMP/PTP 450b BHS Radio attributes - 5 GHz

Device Type							
Link Mode :	# Backha	ul -					
	<ul> <li>Munpoint</li> <li>Timme Master</li> </ul>						
Timing Mode .	* Timing Slave						
5 A 40 A 4		CTOTAL COLOR					
Radio Configuration							
	100 010	2					
	4.9 GR	2					
	No custom	frequencie	s present.				
	5104	*					
	D. I CAL	*					
	0.5152.5	2.0155.0	# 0157.0	× 5168.0	M 2162.5	10160.0	C \$167.5
	# 5170.0	# 5172.5	# 5175.0	# 5177 5	# 5180 Q	# 5182.5	# 5185.0
	# 5187.5	₹5190.0	# 5192.0	₹ 5195.0	# 5197.5	# 5200.0	# 5202.5
	# 5205.0	# 5207.5	# 5210.0	# 5212.5	# 5215.0	# 5217:5	# 5220.0
	# 5222 5	# 5725.0	₩ 5227.5	# 5230 0	1. 5232 5	1,5235.0	+ 5237 E
	₹ 5240.0	# 5242.5	2.5245.0	# 5247.5			
	12225						
	5.2 GH	ž.					
	1 5252.5	₹.5255.Q	₹ 9257.0	2 5260.0	8.5282.5	1 0265.0	1 5267 5
	in 5270.0	# 5272.5	# 5275.0	# 5277.5	W 5260.0	in 5282.5	# 5285.0
	# 5287.5	# 5290.0	# 5292.8	# 5295.0	₹ 5297.5	# 5300.0	₹ 5302.5
	# 5305.0	# 5307.5	# 5310.0	# 5312.5	W 5315.0	# 5317.5	# 5320.0
	# 5322.5	# 5325.0	₹ 5327.5	₹ 5330.0	× \$332.5	5335.0	+ 5837 5
	1.5340.0	# 6342.5	× 5345.0	1 5547.5			
	5.4 GH	z					
	1.5472.5	+ 5475.0	# 5477.5	2 5400.0	2 8482 5	2.5489.0	1.5487.5
	@ 5490.0	# 5482.5	H 5495.0	# 0497.5	¥ 5500.0	# 5502.5	¥ 5505.0
	# 5507.5	W.5510.0	# 5512.5	# 5515.0	# 5517.5	W 5520.0	# 5522.5
	# 5525.0	# 5527.5	₹ 5530.0	₹ 5532.5	# 5535.0	# 5537.5	# 5540.0
	@ 5542.5	# 5545,0	₹ 5547.5	₹ 5550 0	# 0002.5	0.5555.0	₹ 5557.5
	# 5560.0	# 5562.5	# 5555.0	# 5567.5	# 5570.0	if 5572.5	# 5575.0
	# 5577.5	# 5580.0	# 5582.8	# 5585 0	₹ 5587,5	# 5590.0	# 5592.8
Custom Radio Frequency Scan Selection List	# 5595.0	# 5897.5	# 5600.0	# 5602.5	# 5605.0	W 5607.5	# 5610.0
	# 5612.6	# 5615.0	₹ 5617.5	₹ 5620 0	# 5622.5	# 5625.0	₩ 5627.5
	# 5630.0	# 5632.5	# 5635.0	# 5637.5	₹ 5640.0	# 5542.5	# 5645.0
	in 5647,5	H 5650.0	# 5652.5	# 5655.0	# 5657.5	W 5660.0	H 5662.5
	# 5665.0	# 5667.5	# 5670.0	# 5672.8	# 8675.0	# 5677.5	# 5680.0
	# 5682.5	₹ 5685 0	# 5687.5	# 5690.0	# 5682 5	₩ 5695.0	# 5697.5
	# 5700.0	# 5702.5	# 5705.0	1.5707.5	1 2710.0	10712.0	1 3715 0
	# 5717.5	1 5720.0	# 5722.5				

5.7 GHz					
# 5727 E (# 5730.0) # 5732 5 (# 5735.0) / 5737.5 (# 5740.0) / 5742.5					
#5745.0 #5747.5 #5750.0 #5752.5 #5755.0 #5757.5 #5760.0					
#57625 #57650 #57675 #57700 #57728 #57750 #5777					
# 5780.0 # 5782.5 # 5785.0 # 5787.5 # 5790.0 # 5792.5 # 5795.0					
#57975 #5800.0 #58025 #58050 #58075 #5810.0 #58125					
#5815.0 #5817.5 #5620.0 #5822.5 #5825.0 #5627.5 #5830.0					
# 5832.5 # 5835.0 # 5637.5 # 5840.0 # 5842.5 # 5845.0 # 5847.5					
# 5850.0 # 5852.5 # 5855.0 # 5857.5 # 5860.0 # 5862.5 # 5865.0					
#3867.5 #5870.0 #5872.5 #5675.0 #5877.5 #5880.0 #5882.5					
# 5885.0 # 5887.5 # 5890.0 # 5892.5 # 5895.0 # 5897.5 # 5900.0					
# 5902 5 # 5905 0 # 5907 5 # 5910 0 # 5912 5 # 5915 0 # 5917 5					
# 5920.0 # 5922.5					
sa 112 Long sa 112 Long sa 112 April: sa 20 April: sa 20 April: bol evaluate in Recorption					
Select All [Select All 4.9.] Bellect All 5.1.] Select All 5.2.] Select All 5.2.					
Beloct Wr.B.7.   Dillar All   Restore					
# 6 MIQ					
# 10 MH2 # 15 MH2					
# 20 MHz					
# 30 MHz					
# 40 MHz					
1 TO B DO DE DO					
Chie Divertentit					
(0→254)					

MAC Control Parameters		E Contraction of the second
MIMO Rate Adapt Algorithm :	MIMO-A	VB •
Downlink Maximum Modulation Rate :	8x =	
Uplink Maximum Modulation Rate :	8x =	
Minimum Modulation Rate :	tx • B setting	kridging will be disabled if the transmit modulation rate is below this
Power Control		
Transmit Power :	16	dBm (Range: -30 +27 dBm) (13 dBm V / 13 dBm H)
External Gain Fixed :	16 dBi	
LOI Reference EVM		
Reference Downlink EVM :	0.0	dB
Current Downlink EVM :	-33.9 d	8
Reference Uplink EVM :	0.0	d8
Current Uplink EVM :	-34.1 d	B
Access Point MAC Address :	None	
Channel Frequency :	None	
Channel Bandwidth :	None	
		Populate EVM
Advanced		
Receive Quality Debug :	⊖ Enal ⊛ Disa	bled bled

Attribute	Meaning
Link Mode	See PTP 450i BHM Radio page attributes - 5 GHz
Timing Mode	

Attribute	Meaning
Custom Radio Frequency Scan Selection List	
Channel Bandwidth Scan	
Cyclic Prefix	
Color Code	
Large Data Channel data Q	
MIMO Rate Adapt Algorithm	
Downlink Maximum Modulation Rate	See PMP 450i SM Radio attributes - 5 GHz
Uplink Maximum Modulation Rate	
Minimum Modulation rate	
Nomadic Mode	
Transmit Power	
External Gain Fixed	This value represents the fixed antenna gain. The fixed antenna gain for Mid- Gain is 16 dBi and High Gain is 23 dBi.
	For ODUs with integrated antenna, this is set at the correct value in the factory.
	For Connectorized ODUs with external antenna, the user must set this value to the overall antenna gain, including any RF cable loss between the ODU and the antenna.
Reference Downlink EVM	
Current Downlink EVM	
Reference Uplink EVM	
Current Uplink EVM	Refer PMP 450i SM Radio attributes - 5 GHz.
Access Point MAC Address	
Channel Frequency	
Channel Bandwidth	
Receive Quality Debug	



### Note

The frequencies that a user can select are controlled by the country or a region and the Channel Bandwidth selected. There can be a case where a user adds a custom frequency (from the Custom Frequencies page ) and cannot see it in the pull down menu.

## PMP/PTP 450 Series - configuring radio

### Radio page - PMP 450 AP 5 GHz

#### The Radio tab of the AP for 5 GHz is as shown in below table.

Table 56: PMP 450 AP Radio attributes - 5 GHz

Device Type			
Device Setting :	* AP		
	© SM		
Radio Configuration			
Frequency Band	5.4 OH2 •		
Frequency Cartier	Nore •		
Channel Bandwidth	10 M9-Q *		
Frame Period	© 5.0 ms # 2.5 ms		
Cyclic Prefix :	One Soteenth		
Color Code	0 (0254)		
Subscriber Color Code Rescan (When not on a Primary Color Code)	0 Minutes (0 43200)		
Subscriber Color Code Wait Period for Idle	II Minutes (0 60)		
Installation Color Code	© Enabled		
Sector ID :	1.		
(III) A STATE OF A STA			
MAG Control Parameters (	DIMENT OF		
Downlaw Maximum Modulation Data	No. Contraction of the second se		
Lipins Maximum Modulator Rale	1970		
linmatic Unite	* Enabled		
Contractor moves -	CDisabled		
Frame Configuration			
Max Range	2 miles • (Range 1-40 miles / 64 km)		
Downlink Data	75 % (Range: 15 85 %)		
Contention Slots	3 (Range 1 15)		
Auto Contention	- Enabled		
	# Disabled		
Broadcast Repeat Count :	2 (Range 0 - 2)		
Power Control			
Transmit Power	16 dBm (Range -30+22 dBm) (13 dBm V ) 13 dBm H)		
External Gain	0 dBi (Range: 0 - +40 dBi)		
Stil Receive Target Level	-52 dBm (Range -7737 dBm) combined power		
Address of the second Palacened	* Enabled		
Adjacent Checkel Support :	© Disabled		
Mullicast Data Crietral			
Multicast Data Channes	Dualitie •		
Multicast Receat Count	Ranne 0 - 2)		
Multicast Downlink CIR	(kbos) (Banos: 0 - 12182 kbos)		
THE REPORT OF A DESCRIPTION OF A DESCRIP	Contrast Contrasting of the section and the		

Advanced			
SN Registration Limit	238 (Range: 1 - 230)		
Receive Quality Debug :	Enabled     Tisabled		
Frame Alignment Legacy Mode :	Choose Legacy Mode setting from the table below based on colocated rade software revision and sync source Sync Src \ SW Rev 13.4 t or righer 12.0 to 13.4 12.0 to 12.4 Delow 12.0		
	Trauna Port OFF OFF OFF		
	Power Port OFF OFF ON (Mode 1) OFF		
SM Link Test Mode Restriction ;	Enabled .		

Attribute	Meaning
See PMP 45 450i AP Radio attributes - 5 GHz for all parameters details.	



## Note

The PMP 450 AP supports up to 119 Data Channels (instead of 238 Data Channels) when configured for 30 MHz channel bandwidth or 5 ms Frame Period. This limitation is not applicable for PMP 450i/450m Series.

## Radio page - PMP 450 AP 3.65 GHz

#### Figure 37: PMP 450 AP Radio attributes - 3.65 GHz

Device Type			
Device Setting	* AP		
Control County -	© SM		
Padio Configuration	-		
Frequency Carrier :	None	1	
Channel Bandwidth	10 MHz +		
	© 5.0 ms		
Frame Period	* 2.5 ms		
Cyclic Prefix :	One Sixteenth		
Color Code :	0	(0-254)	
Subscriber Color Code Rescan (When not on a Primary Color Code) :	0	Minutes (0 — 43200)	
Subscriber Color Code Wait Period for Idle :	0	Minutes (0 - 60)	
Installation Color Code	En:	abled abled	
Sector ID	0 .		
MAC Control Parameters	Paral de la		
MIMO Rate Adapt Algorithm	(MMO-4		
Downlink Maximum Modulation Rate	6X V		
uplink Maximum Woddiation Hate	Enal	Ned	
Nomadic Mode :	O Disa	bied	
Frame Configuration	_		
Max Range	1	miles V (Range: 1 - 40 miles / 64 km)	
Downlink Data	75	% (Range: 15 — 85 %)	
Contention Slots :	4	(Range: 1 - 15)	
Auto Contention	OEnabled		
Auto Contention .	Disa	Disabled	
Broadcast Repeat Count	2	2 (Range: 0 - 2 )	
Co-located Frame Configuration Option	(Disable V)		
Power Control			
Transmit Power :	15	dBm (Range: -30 - +25 dBm) (13 dBm B / 13 dBm A)	
External Gain :	0	dBI (Range: 0 +70 dBi)	
SM Receive Target Level	-52	dBm (Range: -7737 dBm) combined power	
Adjacent Channel Suncort	© Enabled		
Ladaceut augurate and barr	@ Dis	abled	
Multicast Data Castrol	-		
Multicast Data Channel	Dischi		
Mullicast Casest Count	LISADI	Ursable 1	
municasi Repeat Count	0	(realize, 0 — 2)	
Multicast Downlink CIR	0	(Kops) (Range: 0 - 12187 Kbps)	

Advanced	E				
SM Registration Limit :	238 (Range: 1 238)				
Receive Quality Debug :	Enabled     Bisabled				
Frame Alignment Legacy Mode :	Choose Legacy Mode setting from the table below based on colocated radio's software revision and sync source: Sync Src.\ SW Rev. 13.4.1 or higher (DFS on) (DFS off) below 12.0				
	Timing Port OFF OFF OFF OFF				
	Power Port OFF OFF ON (Mode 1) OFF				
SM Link Test Mode Restriction :	© Enabled ® Disabled				

Attribute	Meaning
Device Setting	Refer PMP 450m Series - configuring radiofor parameter details
Frequency Band	
Frequency Carrier	
Channel Bandwidth	
Frame Period	
Cyclic Prefix	
Color Code	
Subscriber Color Code Rescan (When not on a Primary Color Code)	
Subscriber Color Code Wait Period for Idle	
Installation Color Code	
Sector ID	
MIMO Rate Adapt Algorithm	
Downlink Maximum Modulation Rate	
Uplink Maximum Modulation Rate	
Nomadic Mode	
Max Range	
Downlink Data	
Contention Slots (a.k.a. Control Slots)	
Auto Contention	
Broadcast Repeat Count	
Co-located Frame Configuration Option	If this 3 GHz sector is operating near other LTE sectors or other 5G- NR sectors on the same channel, it is important to enable this co- location option. This will time shift the PMP frame start to in alignment with the LTE or 5G-NR sector operating in the area. The particular LTE or 5G-NR configurations that Cambium can co-locate with are as follows: • For 2.5 ms PMP frame sizes, colocation with 5G-NR
	configuration DDDSU is possible

Attribute	Meaning
	<ul> <li>For 5 ms PMP frame sizes, colocation with 5G-NR configuration DDDSUUDDDD is possible (shown on the GUI selection as DDDDDDDSUU). The proper number of RF-NR Guard Symbols needs to be selected then also.</li> </ul>
	<ul> <li>For 5 ms PMP frame sizes, colocation with LTE frame configurations 0, 1, and 2 is possible. The special subframe and cyclic prefix configurations need to be selected as well.</li> </ul>
	Note that when an operator decides to disable the <b>Enabled</b> parameter, they may need to adjust the <b>Downlink Data</b> parameter as well, considering its complexity. In situations where 5G-NR is chosen but then quickly disabled, it is advisable to utilize the <b>Undo Unit-Wide Saved Changes</b> option instead.
	<ul> <li>Two more detailed technical documents describing co- location between Cambium Networks PMP sectors, LTE, and 5G-NR sectors can be found here:</li> </ul>
	https://support.cambiumnetworks.com/files/colocationtool/
Transmit Power	Refer PMP 450m Series - configuring radiofor parameter details
External Gain	
SM Receive Target Level	
Adjacent Channel Support	
Multicast Data Channel	
Multicast Repeat Count	
Multicast Downlink CIR	
SM Registration Limit	
Receive Quality Debug	
Frame Alignment Legacy Mode	
SM Link Test Mode Restriction	



## Note

When the Channel bandwidth is updated from 20 MHz to 30 MHz not more than 59 subscribers can be registered.



#### Note

The PMP 450 AP supports up to 119 Data Channels (instead of 238 Data Channels) when configured for 30 MHz channel bandwidth or 5 ms Frame Period. This limitation is not applicable for PMP 450i/450m Series.

# P

The CBRS deployments on legacy 450 APs have a limit of only 119 data channels for all bandwidth and frame size configurations (instead of the 238 data channel limit of a 450i or 450m AP).

Even with the 119 data channel restriction, legacy 450 AP CBRS deployments run the risk of overloading the APs CPU. This can cause brief outages due to difficulties maintaining and reestablishing DNS connections to keep the CBRS heartbeats active with the SAS. Operators that experience such issues should either reduce the number of SMs deployed under this AP, restrict the traffic load on those SMs, or replace the legacy 450 AP with a 450i or 450m model.



## Note

Note

APs that were already configured for co-location prior to System Release 22.0 upgrade see their cyclic prefix defaulted to **Normal** and the **S Frame Configuration** defaulted to 7. This should be checked and changed as needed. Note that there is also a slight possibility that the downlink data percentage might be auto-adjusted based on this SSF value of 7 to an undesired value. This should also be checked and adjusted as needed. These corrections can be done directly on the AP. If a large number of sectors need to be adjusted, a small configuration template can be pushed from cnMaestro. A zip file containing 4 sample templates can be found on the Cambium Networks support site:

#### https://support.cambiumnetworks.com/files/pmp450

This zip file contains, in addition to a template that corrects just the special subframe after the upgrade, a template to enable co-location and set the special subframe configuration after the upgrade, a template to enable co-location prior to the upgrade, and a template to disable/backout co-location.